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Volume XVIII

September, 1937

No. 9

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No. 9

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PHYSIOLOGIC EFFECTS OF LOW INTENSITY SHORT WAVE RADIATION

EUGEN WEISSENBERG, M.D.

Medical Superintendent of Short Wave Section of the University Clinic
for Nervous and Mental Diseases

VIENNA

In October, 1934, a report was made to the Biophysical Society for Short Wave Research of Vienna on the method named Low Intensity Short Wave Treatment on the basis of experience with about 2000 patients. Since then the number so treated in the short wave department of the Vienna University Clinic for Nervous and Mental diseases has been doubled. The experiences gained with this large material have again confirmed the therapeutic efficacy. They moreover parallel the observations of other authors, especially in France, Italy and Great Britain.

We name "Low Intensity Short Wave Treatment" (L. I. T.) or "Short Wave Weak Irradiation" any method in which the power conducted to the patient is of a low wattage character. The methods used in the short wave department of the Vienna University Clinic for Nervous and Mental Diseases are generally such in which the intensity in the patient's body amounts to fractions of one watt.

Liebesny of Vienna was the first who recommended a weaker dosage in short wave therapy. He originally used transmitters of large capacity but changed in the course of time to less and less powerful generators. Numerous publications on short wave influence in inflammatory diseases were contributed by him and his pupils. He named his method "The Athermic Short Wave Treatment."

The therapeutic efficacy of low intensity high frequency, however, is regarded by some as incapable of proof. Success obtained in the course of such treatment has been attributed to suggestion or was regarded as a form of psychotherapy.

In spite of the frequency observed soothing and spasmolytic effects of short wave in very small doses, it is quite clear that this observation alone would not be sufficient in order to overcome the criticism that this therapy is efficacious solely by suggestion. It is, therefore, necessary to prove other effects and especially such which can be verified by objective measurements. This is the problem presented in this report.

Deviation Reaction

By "deviation reaction" we imply a phenomenon described by Fischer and Wodak, later by Barany, and finally by Hoff and Schilder. It appears with arms outstretched forward and eyes closed as a normal deviation from their starting point figure 1, (1) outward figure 1, (2). In 1932 Hoff and Weissenberg reported on the influence of certain functions of the brain by short wave. They used the deviation reaction as an indicator. The experiment then was made in the condenser field of a powerful generator. We have since stated that the same results can be obtained with short wave in small dosage.

With a pathologic process in certain parts of the brain the deviation reaction shows a characteristic change from the normal. In a tumor of the right frontal brain for example, the two arms deviate to the right side, and in disease of the right cerebellum to the left. Experimental irradiation of a person with a normal deviation reaction to the right frontal brain with low intensity short wave reveals

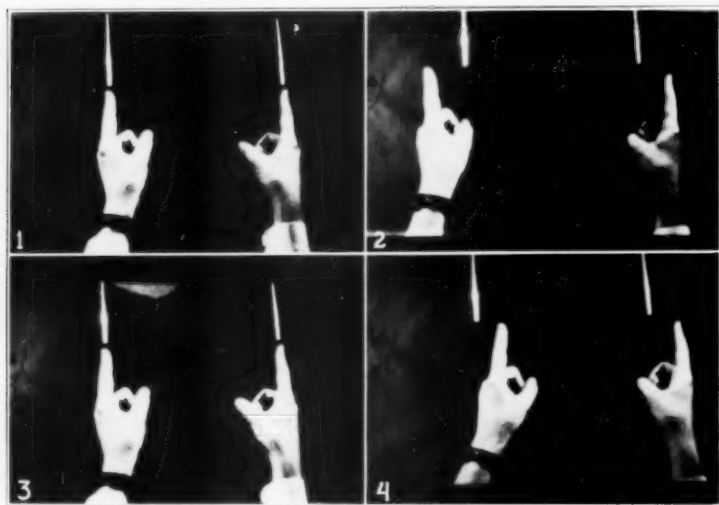


Fig. 1. --- (1) Starting position; (2) normal deviation reaction — the arms deviate outward; (3) starting position; (4) pathologic deviation reaction — by irradiation of the right frontal brain both arms deviate to the right side.

a "pathologic" deviation reaction after 1 to 3 minutes in the same manner as if he had an actual pathologic process in his frontal brain: the two arms deviate to the right side figures 1, (3), and (4).

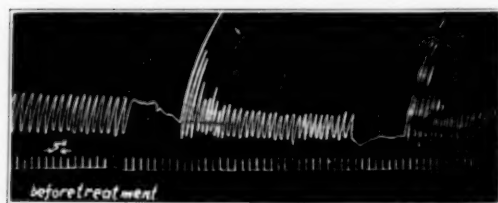
In another experiment of irradiation of the right cerebellum a deviation reaction takes place after a few minutes, which is characteristic for a disease of this side of the cerebellum — the two arms will deviate to the left side. The effect of such irradiation lasts 5 to 20 minutes after the treatment, when the deviation reaction becomes normal again. The subject usually neither feels the irradiation nor has he any knowledge that the arms stretched forward deviate from their original position. These reported experiments can be executed very easily and without any special apparatus. They show a direct influence of short wave in small dosage on the central nervous system.

Diseases of the Respiratory Apparatus

In diseases of the air-way passages an effect of L. I. T. can be demonstrated in several ways. In an acute cold (rhinitis) the lower nostrils become so narrowed by swelling of the mucous membrane that breathing with the mouth closed is rendered more difficult. If such patients are irradiated they experience a sense of relief as if the nose had become more free, often even after a few minutes. Rhinoscopy shows that the swelling of the mucous membrane has receded so that now the patient can breathe easier through the nose with the mouth closed.

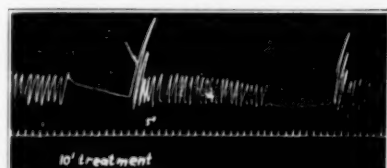
Patients with catarrh of the nasal chambers or of the throat and larynx have a hoarse voice. They complain of dryness and burning in the throat, and an attempt to sing succeeds very imperfectly. After 10 to 20 minutes irradiation the subjective complaints diminish, and if the patients now speak or sing there is quite another result which is noticed both by the patient and observers. The voice has become clearer in tone.

The following Figures show the influence of L. I. T. on asthma. The experiment was arranged as follows: The breathing curve of the patient was registered with the aid of a rubber tube wound loosely around the patient's chest. One end of the tube was closed and the other connected with Marcy's writing capsule. When the thorax is expanded during inspiration, pressure is put on the tube. In expiration the thorax recedes and the tube is discharged. The changes of the



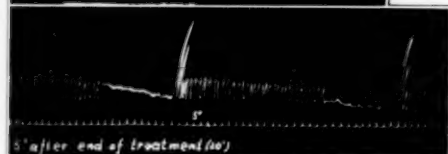
(a)

Fig. 2. — (a) Before treatment. After a pause in breathing several deep inspirations (dyspnea) and, therefore, higher amplitudes;



(b)

(b) after 10 minutes, L. I. T. minor dyspnea; after the pause in breathing only a few deep inspirations are necessary;



(c)

(c) after 20 minutes, L. I. T. — dyspnea still minor in spite of longer pause in breathing. During the pause the pulsations of the heart become visible in consequence of diminution of "volumen pulmonum auctum."

pressure appearing during respiration are registered on a kymograph by the attached capsule. Over the rubber tube the radiating pad is fixed to the patient's clothes. The moment of starting the irradiation was unknown to the patient.

Figure 2, (a) shows the normal breathing before treatment. On the order "now" the patient holds his breath as long as possible. The breathing-pause is recorded on the graph which shows air hunger (dyspnea) and several times a considerable expansion of his thorax when he begins to breathe again. On the graph the amplitudes of these respirations are noticeably higher than before.

After irradiation of 10 minutes a repetition of the experiment shows certain changes figure 2, (b). The patient is now able to longer control his breathing, in spite of which he requires less deep excursions to overcome the dyspnea.

Further treatment of 10 minutes shows this effect still clearer on the graph figure 2, (c). It should be noted that the graph figure 2, (c), differs from the preceding ones in that it also shows a record of pulsations of the heart during the pause in breathing. On the assumption that there was an increase of the volume of the lungs before the beginning of treatment, one can conclude that this condition has disappeared, which makes possible the appearance of the pulsations of the heart. It can be, therefore, deduced from the graphs that: —

1. The patient developed more power after treatment. He is able to stop inspiration longer without the subsequent dyspnea being as prolonged as before treatment (two forced inspirations instead of five to eight before treatment).

2. The increased volume of the lungs has receded (the pulsations of the heart become visible during the same pause in breathing).

Voluntary Apnea and Vital Capacity

Patients with other pulmonary diseases, as bronchitis or emphysema react very favorably to L. I. T. The irritating cough is diminished, expectoration and breathing are improved.

This effect is also expressed in the change of measurements, e.g., the duration of the maximum voluntary pause in breathing, which becomes definitely longer. If the patient was able to hold his breath for 20 seconds before treatment, he is able to do it for 30, 40, even 50 to 60 seconds after treatment. There are of course, individual differences as with any other function.

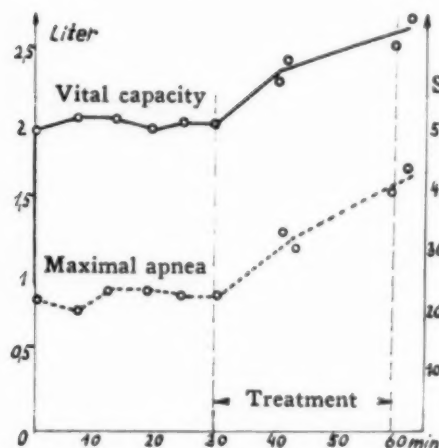


Fig. 3. — Increase of the vital capacity and of the maximum voluntary stop in breathing (apnea) following L. I. T.

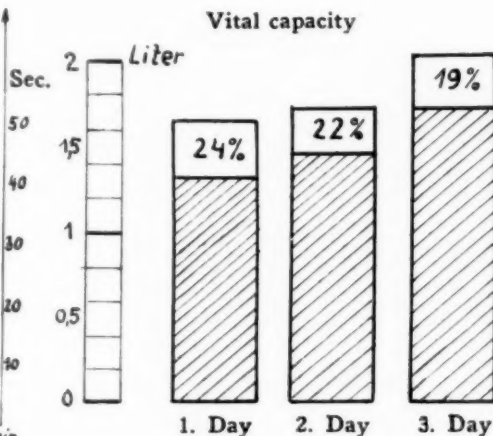


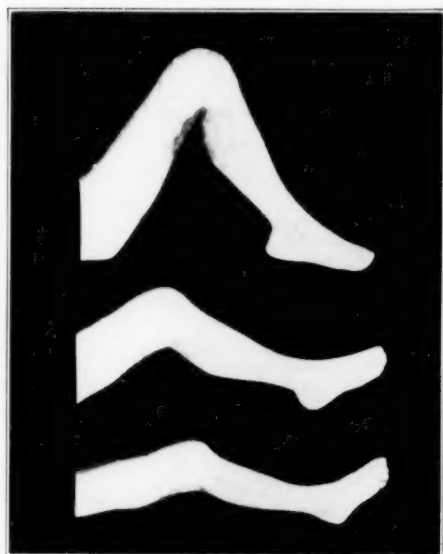
Fig. 4. — Increase of the vital capacity in the course of a L. I. T. during 3 succeeding days. The percentage of daily increase is shown.

The vital capacity increases after L. I. T. "Vital capacity" means that volume of breathing which a human being can expire maximally. The measurement was executed in our experiments by means of a dry gas-clock (Elster). Figure 3 illustrates the change obtained by L. I. T. in a patient with bronchitis. The vital capacity and the maximum voluntary apnea are registered in relation to time. It is to be noted, however, that the patient must be first trained for this test. During this training period the values of the vital capacity and of the pause in breathing often increase to a considerable extent. But after some trials one reaches values the dispersion of which is limited. Then the actual registration can start. At first the measurements are controlled during 30 minutes without any treatment. Then the radiating pad applied during the whole experiment is now connected with the generator without knowledge of the patient. One perceives clearly the increase of the vital capacity and of the pause in breathing. Figure 4 shows the daily increase of the volume of breathing in 3 succeeding days of treatment.

Limitation of Motion in the Joints and Muscles

A successful field for the application of L. I. T. is for diseases with temporary limitation of motion in the joints, and it is quite irrelevant whether their etiology is infection or trauma. Not only is pain diminished for hours by the treatment or even disappears entirely, but one can observe better mobility after treatment. This fact can be proved objectively in the simplest manner by measuring the articular motion with a goniometer before and after treatment. Changes of 10 to 15 degrees after treatment are not rare. Figure 5 shows the success of a L. I. T. in a case of acute arthritis of the knee-joints owing to granuloma of teeth. The illness existed for 6 weeks before the beginning of short wave treatment, and in spite of various other treatments there developed increasing contraction, so that two specialists advised operative extension of the knee. After 8 irradiations a remarkable improvement was noted and extension of the knee became nearly normal after 15 irradiations.

Figure 6 shows the effect of L. I. T. in a case of lumbago. The patient was ordered to bend down maximally. Then a low intensity short wave treatment was given for 30 minutes. The patient was able to bend much lower after treatment, which can be explained by the frequently observed effect of this irradiation.



- (a) Fig. 5. — Improvement of the mobility of the knee-joint in arthritis — (a) before treatment the fixed contraction of the knee-joint allows active and passive motions for a few degrees only;
- (b) (b) after 8 L. I. T. the knee can be stretched far better;
- (c) (c) after altogether 15 L. I. T. the mobility of the knee has become almost normal.

Fig. 6. — Improvement of mobility in a case of lumbago — (a) maximum bending down before treatment;

(b) maximum bending down after one L. I. T. of 30 minutes.



(a)

(b)

Changes of Skin Resistance

Putting direct tension to the skin by means of two electrodes, the skin will oppose the passing of the current by a certain resistance. This can be easily determined according to the law of Ohm by measurement of the current. Gildemeister and his pupils demonstrated that the value so found is not real ohmic resistance in the electro-technical sense but only an apparent one produced by processes of polarization in certain layers of the skin. This apparent measured resistance represents a variable value which is due to several factors. Veraguth has shown in 1909, that the vegetative nervous system has a special influence on the quantity of resistance. If we measure the resistance of a person who gets excited in any way it will sink almost suddenly; it gradually resumes normal value when the excitement ceases. This phenomenon was named by Veraguth the "psychogalvanic reflex." Richter demonstrated that the values of resistance are extremely high during sleep. Figure 7 shows two curves of resistance recorded from the right and the left hand of a patient. The two curves first rise moderately and reach a stationary value at that moment in which the

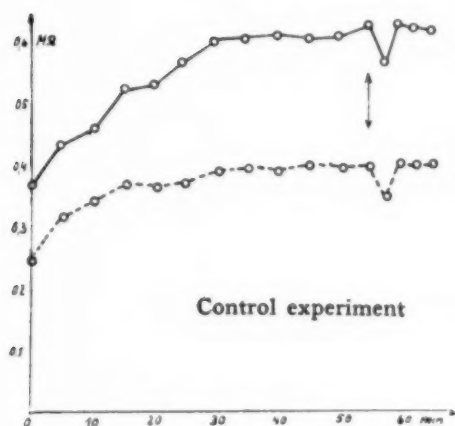


Fig. 7. — Curve of the resistance of the right and left with apsycho galvanic reflex provoked by a question addressed to the patient.

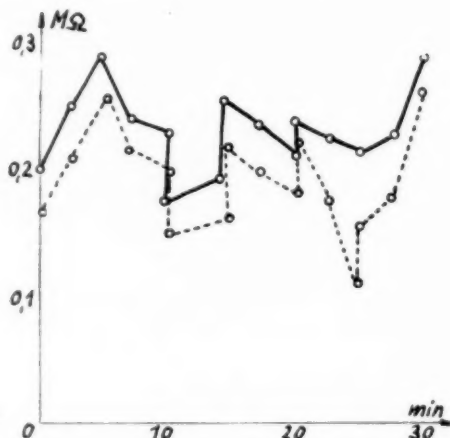


Fig. 8. — Course of the resistance of a patient who was in continuous psychic excitement.

patient was asked: "How many is 3×4 ?" The patient answered promptly and correctly; nevertheless one can see that the two curves show slight reduction of the resistance due to the psychic excitement caused by question.

Figure 8 shows the course of resistance measured on the two hands of a patient who was excited during the whole duration of the experiment in consequence of external influences. Persons came in repeatedly during the measurements who informed themselves about the results of the measurement or who spoke to the patient himself.

Figure 9 shows a patient's resistance measured continually from 3:00 P.M. to 6:00 A.M. The curve shows a continued course to about 8:00 P.M. Then it rises rapidly to about twelve times the starting value from the moment in which the patient fell asleep. It rests then at a high level till 1:00 A.M. when the patient awoke for a while. The resistance then sinks deeply but rises immediately to the former level. At 4:00 A.M. the patient awakes and does not fall asleep any more. The resistance sinks rapidly to the value of the previous day. The graphs of resistance, therefore, show objectively whether the patient slept deeply, how long he slept, and when he awoke.

Under pathologic circumstances localized to one side of the body only there are most often considerable differences between the values of resistance of the healthy and the affected side. The involved side generally shows minor resistance according to a condition of excitement by the pathologic process. Changes of resistance provoked by excitement generally are demonstrable on both sides, except that the affected side does not react owing to a destruction of the nerve paths which conduct the excitement.

Similar experiments have been made by Julia Sergejeff in the Neurologic Clinic of Professor Kroll, Moscow. She found that the normal side, too, shows changes compared with the normal values. These results have been placed by Kroll among the "phenomena of repercussion" described by him.

Figure 10 shows two graphs of resistance measured on the soles of the feet of a patient who frequently complained of very intense and painful cramps in the calf of the right leg. The cause was thought to be a pathologic process in a certain sphere of the brain, namely, the thalamus. The values of resistance first rise in the beginning of measurement and then sink after about 15 minutes, at first slowly and then rapidly. After about 3 minutes the subject experiences intense pain followed by a violent cramp in the right calf. The illustration shows that at first the resistance is decidedly lower on the affected than on the normal side.

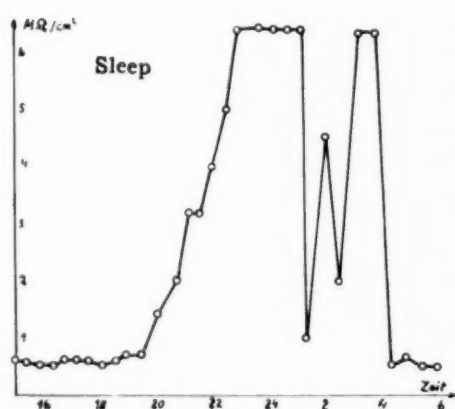


Fig. 9.—Skin resistance during sleep, its rapid increase at onset of slumber, its sharp fall due to temporary awakening, its rapid rise and fall and its final sharp decline to level of the previous day on complete awakening of subject.

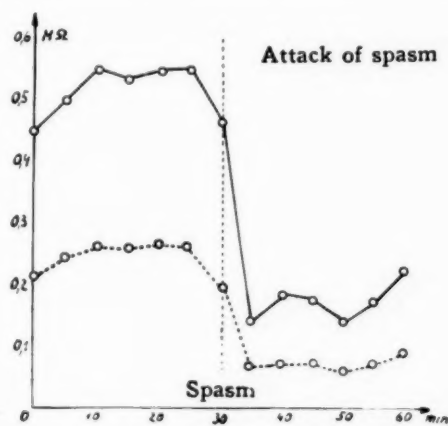


Fig. 10.—Change of the skin resistance during a cramp attack in a calf. The involved side shows a lower resistance (dotted line); rapid sinking of the resistance on both sides several minutes before the beginning of the spasm.

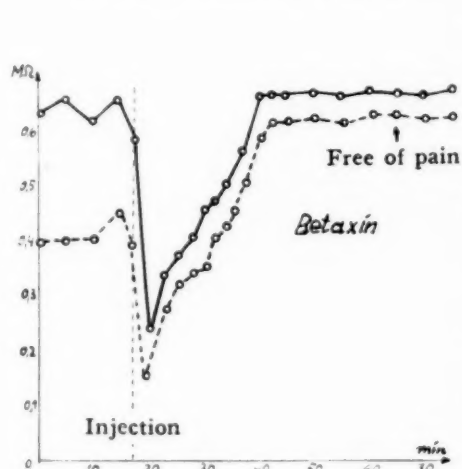


Fig. 11.—Change of the skin resistance due to a Betaxin-injection. This drug assimilates the lower resistance of the affected side to the higher of the healthy side. This assimilation precedes the phase of painlessness temporarily.

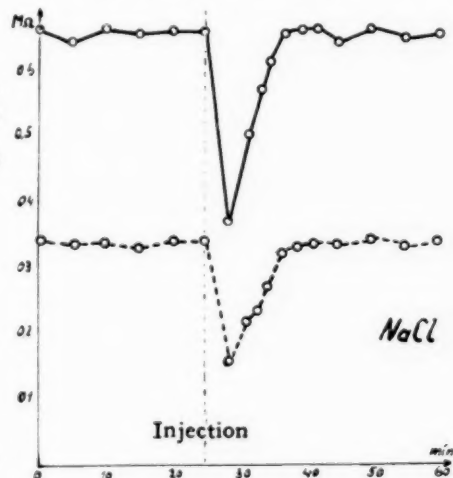


Fig. 12.—Change of the skin resistance due to an injection of a physiologic solution of salt; the difference between the values of resistance rests unchanged before and after this ineffectual injection.

Great excitement then becomes manifest by the rapid lowering of the resistance at the moment of the approaching cramp about which the patient has no knowledge. We can see from the preceding graphs that the resistance of the skin is a useful indicator for the evaluation of existing excitement. The next two graphs must be studied from this point of view.

Figure 11 represents two graphs of resistance registered from the right and the left hand of a patient with herpes zoster located on the right side. She was given a betaxin injection for her severe pain at a designated time. One sees here, too, the difference between the effect of the involved sick and normal side, with the higher value on the latter. Owing to the pain caused by the injection itself, together with the psychic excitement, the resistance is shown to sink rapidly and then it rises successively until the starting value is reached again. The soothing influence of the injection, however, causes a higher rise of the resistance on the side pathologically excited, so that at the moment in which the resistance has become constant the difference between the affected and nor-

mal side is less than before. Analogous to figure 10 it can be seen that the value of resistance corresponding to no pain has been registered before its beginning came to the patient's knowledge.

Figure 12 serves to answer the question whether our assumptions and conclusions respecting the interpretation of the registered measurements of resistance are justified. The same patient received an injection of a physiologic solution of common salt under quite equal conditions as shown in figure 11. As such an injection has no soothing effect, nothing else can be observed on the graph as the result of this injection than a change of resistance corresponding to the excitement provoked by the injection per se. These changes of the value of resistance will be used to judge the therapeutic effect of L. I. T. which is of especial interest to us all.

We have observed the soothing effect of short wave treatment with small dosage in a large number of patients suffering from conditions of excitement. In order to prove these effects we have registered among others the values of resistance of the right and the left hand in a patient with epilepsy while the sympathicus of the neck was treated on both sides for therapeutic purposes.

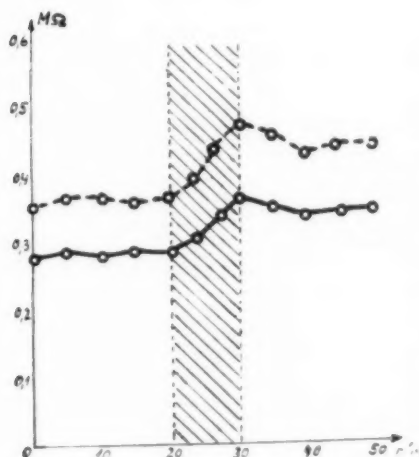


Fig. 13. — L. I. T. of the sympathicus of the neck on both sides. The skin resistance of both hands increase.

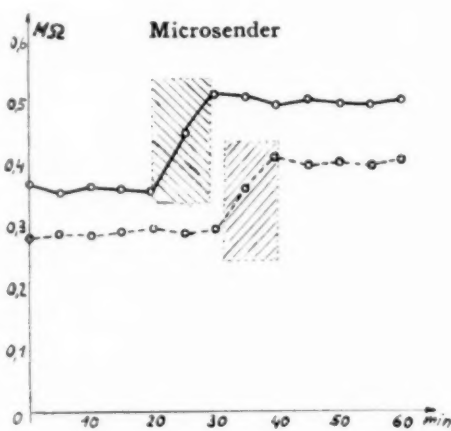


Fig. 14. — Irradiation of the sympathicus of one side only increases the resistance of the same side. We used for this experiment a transmitter with a capacity of half a watt.

Figure 13 shows the rise of the values of resistance on both sides soon after the treatment was started. These values still rest on a higher level after stopping the treatment. If the patient was treated on one side of the neck only, the resistance rises only on this treated side. If after the other side of the neck was treated, the resistance rose also in the other hand (fig. 14).

It is a highly interesting fact that the values of resistance react contrarily during treatment of the sympathicus of the neck in the condenser field of a generator with a high output; the resistance sinks on both sides (fig. 15) and remains at a lower level also after treatment.

The graphs in figure 16 were obtained by measurement not with one tension only but rapidly with various ones in succession. They represent accordingly the dependence of the skin resistance on the tension.

We have recorded such graphs in a patient with trigeminal neuralgia on the left side. The following graphs clearly show the minor resistance on the affected side (fig. 16). The patient first was treated by ultraviolet rays and she reported that the pain had increased. After this treatment the resistance of the affected side sank still more and the difference between both sides became greater. A

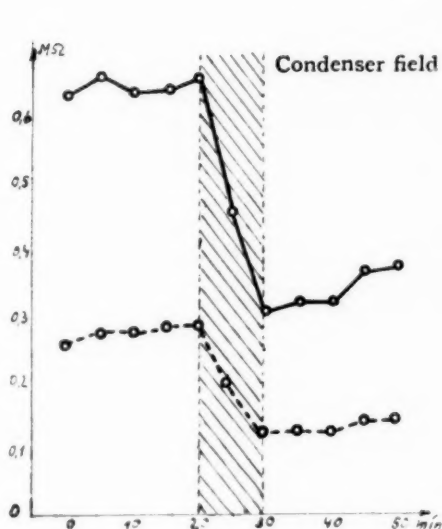


Fig. 15. — Treatment of the sympathetic of the neck in the condenser field of a transmitter with high output; the skin resistance sinks on both sides.

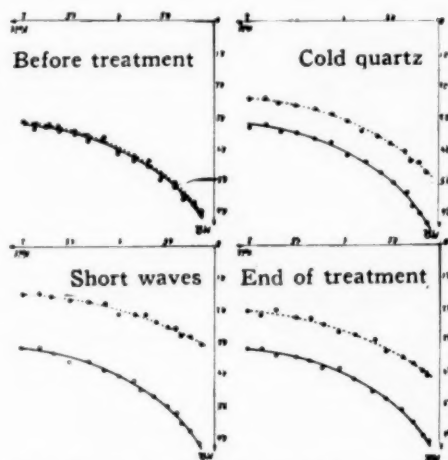


Fig. 16. — Change of the skin resistance in the course of physical treatments in a case of trigeminal neuralgia. The affected side shows the lower resistance which is still more lowered by ultraviolet treatment. The patient feels worse (more pain). By a L. I. T. the resistance of the affected side increases, the patient reports less pain. After healing there is no difference between the values of the skin resistance of either side.

short wave L. I. T. was then given and a distinct rise of the value of the resistance on the left side can be observed. The difference between the affected and the normal side has diminished. The patient reports that the pain is less intense and appears less frequently. She then was given only a low intensity short wave treatment. The measurements were continued in this case during course the entire of treatment. It was observed that the recorded graphs on the affected and on the normal side approached each other gradually in accordance with the improvement of the neuralgia. When the disease was cured every difference between the values of resistance on both sides virtually disappeared. A control measurement 6 weeks after the conclusion of treatment showed the same unchanged picture. Subjectively the patient also was completely free from complaints at that time.

If the demonstrated changes of the skin resistance in connection with L. I. T. speak for a soothing effect of this treatment on the central nervous system, then another conclusion might be allowed. Ebel and Mautner base the opinion upon their experimental research that soporifics arrest inflammation in infectious processes. As was demonstrated, the skin resistance rises considerably during sleep. It shows changes in the same sense by L. I. T. This might be an explanation that inflammatory diseases, such as for instance a felon or suppurative sinusitis, are favorably influenced by short wave L. I. T., as we have observed in numerous cases.

The changes of the skin resistance were examined by a measuring instrument constructed for this especial purpose. Its manner of function is shown by the scheme of connections (fig. 17). The tension for the measurement is obtained from a dry battery. It can be raised to any desired value between 0 and 15 volts by two potentiometers which serve for rough and fine regulation. The tension can be controlled by the voltmeter V. Measurement of the current is made with the aid of a moving coil instrument with a maximal sensibility of 10^{-7} (fig. 17, A). The instrument permits the application of several pairs of electrodes, so that various parts of the body can be measured simultaneously. Figure 18 presents a sketch of the electrodes. In order to avoid any interfering

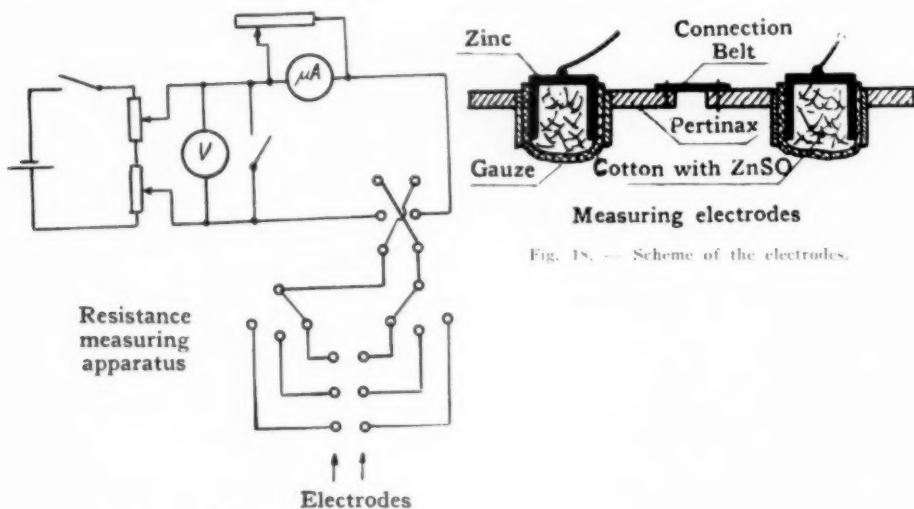


Fig. 17. — Scheme of connections.

Fig. 18. — Scheme of the electrodes.

influences on the electrodes by polarization, little basins of zinc are employed, fitted with wadding impregnated with a solution of 1 per cent zinc sulphate. The electrodes are fastened to the desired part of the body by a rubber bandage.

The graphs shown in this article are not isolated observations but examples of a large number of measurements which speak for a clear effect of low energies of ultra-high frequency. These results can be easily verified by objective methods. The therapeutic efficacy of low intensity short wave irradiation is therefore proven on the basis of experimental tests.

Summary

An attempt has been made to prevent objective proofs of the efficacy of low energies of ultra-high frequency radiation. We have found:

1. The normal deviation reaction is changed temporarily by the irradiation of certain parts of the brain, as if the irradiated parts of the brain were afflicted.
2. In accordance with the clinical efficacy of short wave in inflammatory diseases of the air passages (arrest of the secretion, improvement of hoarseness and expectoration in bronchitis, emphysema and asthma) we have demonstrated the change of the vital capacity by irradiation in such diseases.
3. It is demonstrated by respiratory graphs that the L. I. T. facilitates breathing and extends the longest possible time of stoppage of breathing (voluntary apnea).
4. Improvement in the mobility in diseases of the muscles and joints obtained by the described treatment can be proved by precise measurements and photographic registration respectively.
5. The skin resistance of an affected side is lower than that of the healthy side. By L. I. T. the resistance of the pathologic part becomes identical with that of the healthy side.

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(Continued on page 575)

DELAYED UNION OF FRACTURES *

Analysis of Cases

ALLEN F. VOSHELL, M.D.

BALTIMORE, MARYLAND

Early in 1935 before the Eastern Section of the American Congress of Physical Therapy I presented preliminary observations that had been made with reference to the treatment of delayed union of fractures. These informal observations were later coordinated into a short paper which was printed in the *Archives* in March, 1935. The response to this stimulated a continuance of clinical use of one of the modalities discussed, and I take pleasure in again analyzing the experiences and observations. Thirty-eight cases are included in the series, but I wish to emphasize that I consider the subject to be still in the preliminary stages of investigation.

Vascular Exercise

In the earlier report two methods of stimulating callus organization were described, namely, diathermy and passive vascular exercise by alternating air pressures. Since then no more cases have been treated by the passive vascular machine, but all have received diathermy of one type or another. I should like to show the chart of the cases treated by passive

TABLE 1. — *Passive Vascular Exercise*

Name	Age	Color	Sex	Location and Type	Months Ununited No.		Union Clin. X-Ray		Remarks
J.L.	32	W	F	Radius + Ulna: simple	3	16	Rad. + Ulna	Rad. + Ulna	Open reduction both 6 days 2nd reduction ulna: union
J.F.	30	W	F	Radius + Ulna: simple	6	22	+	+	Open reduction early Improved after 8 treatments
A.F.	40	W	F	Tibia + Fibula: simple	3	39	+	+	Improved after 6 treatments
G.H.	43	W	F	Tibia + Fibula: com. simple	4	21	+	+	Improved after 12 treatments
H.R.	30	W	M	Tibia + Fibula: simple	4	19	+	+	Improved after 12 treatments
R.H.	32	W	M	Tibia + Fibula: multiple	6	17	+	+	Improved after 12 treatments
H.M.	38	W	M	Tibia + Fibula: comp. comm.	5	24	+	+	
J.H.	47	W	M	Tibia + Fibula: simple	10	25	+	+	Improved after 7 treatments
H.H.	80	W	M	Tibia + Fibula: comp. comm.	12	24	+	+	Improved after 16 treatments then sequestrect. union
				41-8/9	Average	5-2/3	23-1/9		

vascular exercise as these are not included in the present analysis except in one instance, (table 1). At some later date the treatment of a larger series of cases by means of this circulatory exercise would be interesting for the preliminary findings suggest its possible value in forestalling non-union.

Since there is no standard by which one may determine a fracture to be "delayed" and hence probably later ununited, some criteria must be established. This is difficult since some cases have been treated at the request of surgeons who became apprehensive toward the end of a slightly longer normal period, although the fracture might have finally united without help. Consequently the chief factors in selecting cases for treatment are the location of the fracture and evidence of very little if any union by clinical examination and x-rays. It is well known that a fracture may be firmly united clinically and yet show little, if any, evidence of calcification of callus in

* Read at the Fifteenth Annual Session of the American Congress of Physical Therapy, New York City, September 8, 1936.

the x-ray films. I must again stress the fact that chief dependence is placed upon the clinical examination, and to strengthen this feature all our cases have been checked by several examiners.

The common sites for delayed union are the tibia (middle-upper thirds), the forearm (middle-third) especially the radius, the humerus (middle third)

TABLE 2.—*Diathermy: Conventional*

No.	Name	Age	Color	Sex	Location and Type	Months post-injury	Diathermy		Result		Remarks
							No. Rx	Amount	Clinic	X Ray	
1	H.M.	32	W	M	Femora, low 1/35	14	500	25	+	+	Lt. refract. manip. Rt. refract. fall
2	L.C.	48	W	M	Tibia, shaft	4	"	20	+	?	No post. X-ray
3	H.H.	80	W	M	Tibia, shaft	5	"	13	+	?	No post. X-ray Pavac
4	W.D.	38	W	M	Humerus, mid. 1/3	24	"	21 preop. 30 postop.	—	—	No union Atrophy distal fracture
5	W.E.	47	W	M	Tib. comp. comm. low	3 1/2	"	17	+	+	No post X-ray
6	J.B.	70	C	M	Tib. comp. comm. mid.	2 1/2	"	10	+	?	Contus. + lacer. Wassermann +
7	J.H.	52	W	M	Femur, comm. low	3	"	17	—	—	Still treating
8	J.C.	32	C	M	Humer., obliq., low	4	"	20	+	—	up, end loose frag. low, end loose frag. Op.
9	C.K.	30	W	M	Tib. + Fib. low 1/3	3 1/2	"	12	?	?	Other fractures united normal
10	J.L.	26	W	M	Tib. + Fib. mid.	4 1/2	"	30	—	—	Contus. + lacer Malnutrition
11	P.W.	40	W	M	Tib. + Fib. h., union Tib., comm. Fib. rt. no union	3 1/2	"	36 to rt.	+	+	Other leg united normal Osteo: very fat
12	J.W.	63	W	M	Femur, shaft, low.	3	"	18	+	—	Still treating
13	I.K.	51	W	M	Humerus, multiple	3	"	28	+	+	
14	P.M.C.	33	C	M	Humerus, comp. comm.	3	"	41	+	+	
15	D.H.	43	W	M	Tib. + Fib., comm.	3	"	12	+	+	
16	I.F.	12	W	M	Tib. + Fib., mid.	3	"	12	+	+	
17	J.W.	50	C	M	Tib. + Fib., comm.	4	"	36	+	+	
18	R.D.	32	W	F	Femur, mid.; Infect. P.O.	12	"	12	—	—	
19	J.C.	35	W	M	Humerus, low. 1/3 comm.	2 1/2	"	10	—	—	
Average						6.7/10		27.7/19			

TABLE 3.—*Diathermy: Short Wave, 17 Mc/sec*

No.	Name	Age	Color	Sex	Location and Type	Months post-injury	Diathermy		Result		Remarks
							No. Rx	Amount	Clinic	X Ray	
1	L.F.	62	W	F	Femur, neck	2 1/2	1500	35	+	+	Faster, normal
2	M.S.	41	W	F	Femur, shaft	3 1/2	"	14	+	+	3 mos. later
3	J.F.	21	W	M	Tibia, mid. 1/3	3	"	25	+	?	No post X-ray
4	K.S.	77	W	F	Femur, shaft	4	"	33	+	+	
5	K.E.	72	W	F	Femur, neck	3	"	42	—	—	No union
6	A.N.	37	W	M	Radius, shaft	6 wks.	"	10	+	?	No post X-ray
7	E.M.	21	W	M	Radius — ulna	9 wks.	"	10	+	?	No post X-ray
8	J.M.	38	W	M	Tibia, mid. 1/3	3	"	25	+	+	No post X-ray
9	I.R.	50	W	M	Radius — ulna	3	"	31	+	?	No post X-ray
10	M.R.	24	W	F	Clavicle, mid. 1/3	2 1/2	"	12	+	+	
11	A.S.	44	W	M	Femur, shaft	3	"	17	+	+	
12	W.H.	34	W	M	Tibia, mid. 1/3	3 1/2	"	17	+	+	
13	E.W.	40	W	M	Tib. + Fib. mid. 1/3	3	"	15	+	+	
14	R.S.	18	W	M	Femur, up. 1/3	3 1/2	"	15	+	+	
15	J.G.	60	W	F	Femur, mid. 1/3	4	Induct.	30	+	+	Improved; still treating
Average						3.1/15		22.1/5			

and the neck of the femur (intracapsular). Any bone may be delayed in uniting, though much less frequently than those noted above. Most of the fractures are transverse, though some may be comminuted or even oblique.

Each case is considered from the time when first seen by the physical therapist in consultation with the supervising surgeon. Many of the cases

are what is known as "compensation type," so that repeated x-rays were not taken for financial reasons which somewhat hampers the observations. No explanation is offered for the results other than the localization of deep, low heat repeatedly applied which must cause speedier organization due to the improved circulation, as nothing has yet been offered to show where alternating electrical currents affect directly the organization of tissue. I feel very much encouraged with the results to date, but realize that a much larger series of cases must be available for study before any basic statements may be made to standardize the method.

Two to three years ago the spark gap machine was the conventional and only one available to develop diathermy, so that most of the cases listed here were treated by this agency, but recently short wave apparatus have been tried, that is, those developing 17 and 6 meter wavelengths. I have the impression that conventional diathermy gives better localized effects.

Current amounts used now are 500 milliamperes on conventional and 1,500 on the 17 meter short wave apparatus with no measurable quantity on the 6 meter apparatus. The above low amounts were selected due to the well-known absorbable effects of the higher quantities as demonstrated in

TABLE 4.—*Combined Treatment With Conventional and Short Wave Diathermy*

No.	Name	Age	Color	Sex	Location and Type	Months Post. Injury	Diathermy Am't. + Type	No. Rx.	Result Clinic X-ray	Remarks	
1	C.A.	60	C	M	Humerus, up.	1/3 3	S.W. 6 11 Conv. 4 = 15	+	?	No post. X-ray	
2	E.K.	38	W	M	Femur, mid.	1/3 4½	S.W. 17 20 Conv. 25 = 45	+	—	Slight incr. in callus, incomplete	
3	E.G.	29	W	M	Ulna, mid.; postoperative	3½	S.W. 17 14 Conv. 12 = 26	+	+	Radius, femur united normal S.W. through cast	
4	W.E.	33	C	M	Tip.; p.o. 22 mos. after injury	2 post. op.	S.W. 6	23	+	+	Might have united alone

the treatment of calcified bursitis wherein the calcified nodules rapidly disappear under large current dosage.

Electrodes were applied opposite each other whenever possible even though windows need be cut in casts; once in a while cuffs were applied above and below or some other method used. The short wave current was used at times through casts, but wherever possible the extremity was uncovered. Treatments were given every other day for thirty minute periods. Casts or splints were used for immobilization in most cases until union was complete.

Thirty-eight cases are presented involving different bones and treated in several hospitals by several surgeons. Only one case was seen less than nine weeks after injury and most were over three months. Due to the success achieved in some cases the surgeons are sending others for treatment just as soon as they become suspicious that union might be slow; they will not even wait until the term "delayed" can be applied. This at least indicates that some educational progress has been made.

All cases but one needed ten or more treatments before improvement could be noted; one even required forty before union seemed firm. Usually an indefinite number of treatments were given after union was apparently complete. It has been demonstrated that x-ray evidence is not conclusive for clinical or functional union; it seems to be a variable factor and must not be used to decide the issue. In the thirty-eight patients, forty fracture problems are considered due to either multiple fractures or to treating the same fracture pre- and post-operatively.

Clinical union occurred in 30 fractures, improvement in 3, and non-union in 7. Four cases are still being treated and may show union later. One case might have united without the aid of diathermy, since a bone graft operation had been done for old non-union, with diathermy beginning two months afterwards. The 6 meter short wave was used in this case.

Solid clinical and functional union therefore occurred in 78.9 per cent with the possibility that this may be raised to about 87 per cent. Even eliminating all possible doubtful cases for any reason whatever, the percentage still is sufficiently high to justify a continuation of the method with confidence in its rationale and results.

Definite thickening of the soft callus surrounding the fracture occurs after about eight or more treatments and this steadily hardens and thickens until union occurs; in conjunction with this, the hinge-like abnormal mobility slowly diminishes. In one case the ends of silver wire could be felt to disappear as the callus spread.

It is evident therefore that diathermy is of considerable value in speeding-up or even creating the organization of callus, so that non-union is prevented or the length of the delay period is shortened. I would suggest its use in all cases where development of the callus does not seem to be consistent with one's expectations based on the usual standards. A combination of "short wave" with the conventional has been used, due to my own impression that the better localization of the latter is more stimulating.

No special accessory aids were used in any of the cases, such as diets, viosterol, etc. Scientific, physiologic experiments will explain the reason for the clinical features here presented, and it is to be hoped that such will be forthcoming so that the statements made may be justified.

Summary

1. The use of diathermy in delayed union of fractures is again presented, still however as a preliminary study.
2. The necessity of using low milliamperage is strongly emphasized.
3. Thirty-eight cases are studied and the statistics analyzed. Union occurred in 30 cases or 78.9 per cent.
4. All are urged to try the principles expounded and collect facts for future analysis.
5. An ambition is expressed for the development of a physiological explanation of these clinical facts.

Conclusions

Diathermy properly applied is of distinct value under certain circumstances of delayed union of fractures. Its continued use will prove perhaps the reasons for the above statement. It is hoped that many others will find the same results to be true. Suggestions and constructive criticisms will be heartily welcomed. The experiences of others will be received with much interest and when a sufficiently large series can be collected, useful data will be published.

Medical Arts Building.

BONE NECROSIS IN INTRAORAL CANCER *

D. E. EHRLICH, B.A., M.D.

NEW YORK

This is a preliminary presentation stimulated by the unavoidable confusion in the past in the differential diagnosis between bone necrosis related to malignancy and bone necrosis due to radiation therapy. Bone necrosis is common in mouth cancer. The literature on this subject is sparse and is rightly concerned more with diagnosis and therapy of primary mouth cancer. Bone pathology, however, is often a stumbling block of prime importance as has been brought out previously by Pfahler,¹ and others. Pfahler in a discussion on treatment of epithelioma of the cheek states "that where the disease has extended from the cheek into the alveolar process and especially when it has reached the inferior dental canal it is often advisable to resect part of the lower jaw going well beyond the diseased area."

Albright² in his tabulation states that Billroth in 1862, did the first osteoplasty — resection of the lower jaw. To those interested in the topic of mouth cancer, permit me to recommend a study of Albright's article on "Carcinoma of the Mouth — With Especial Reference to Treatment," which presents a complete historical survey of the entire subject, very succinctly phrased and with an extensive bibliography. I quote part of his opening paragraph:

In frequency, cancer of the mouth ranks second to that of the breast and uterus. It is among the most accessible, yet highly fatal, of cancers, with a mortality rate of from 75 to 90 per cent. The lesions are readily recognizable, yet tend to early disintegration, infection, and regional spread.

Etiology

The three essential factors in the causation of bone necrosis are: (1) direct extension of the primary tumor; (2) infection; (3) radiation necrosis.

These factors are variable in their extent and importance in individual cases. Albright² states that mouth infection is the most constant finding, occurring in 50 per cent of the cases of primary carcinoma. It must be recalled that intraoral primary malignancy may begin in the lip, tongue, floor of the mouth, cheek, palate, gums and also in the tonsillar and pharyngeal regions. From the pathologic classification we must consider all types of carcinoma and sarcoma, and the rarer types of melanoma, etc. Metastases from oral cancer are as a rule local and regional, rather than remote or distal. Their spread is by contiguity and then through the lymphatic channels into the adjacent structures. Intraoral cancer by contiguity extends into the adjacent bone after penetrating the overlying periosteum and then gradually destroys the bone. This is seen more commonly in the floor of the mouth and tongue cases. Gradual erosion of the bone begins at a localized point of compact cortical bone and extends slowly inward to the medulla in an increasingly wider and wider zone. When the bone involvement first begins the roentgen appearance may not be sufficiently characteristic to indicate bone destruction. As soon, however, as the medulla is involved, one can see the definite localized, irregular destruction usually close to the tumefaction discovered clinically. As soon as the outer layer of bone is involved, infection which is ever present in mouth cancer cases, contacts the point of lesion, resistance is lowered and low-grade osteomyelitis begins to develop. This will vary in

* From the New York City Cancer Institute, Department of Hospitals, Ira I. Kaplan, M.D., Director.
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amount and extent in each case. In some instances, the infection is sufficiently severe to involve the entire mandible with sequestration.

Radium, together with deep x-ray therapy delivered to the cervical regions, in many cases gives no change in the pattern of the bone despite the fact that some low-grade, chronic reaction to the periosteum and bone occurs. In other cases, as time goes on, a definite destruction takes place which resembles greatly that seen in the direct extension from the malignancy itself, with the sole difference that the radiation necrosis is more apt to show a more sudden involvement of bone in a wider area rather than a gradual one. The milder cases of radiation necrosis of bone eventually clear up without any necessity for surgical intervention. When the necrosis is more extensive with sequestral formation, it becomes a surgical problem because of the great pain and the inability of the system to remove the pathologic process. Albright² says:

The difficulties of radiologic treatment are great. The periosteum is exceedingly sensitive to radium. The ordinary dose causes necrosis in which cancer may grow rapidly (Berven). Radiated bone becomes osteomyelitic. The sequestration is so slow and painful that early resection of the involved bone is indicated.

Development of Osteonecrosis

Amodeo³ traces the stages in the development of osteonecrosis as follows: the stomatitis following radium results in retraction of the gums, partially exposing the roots of the teeth. Chronic inflammation of the dental pulp follows and often eventuates in gangrene of the dental pulp. Teeth in this condition serve as a focus for bacteria which set up inflammation and necrosis in the bone surrounding them, the nutrition of which has been damaged by the previous radiation. Such teeth must be extracted. If this is done promptly sequestration of the necrotic bone and eventual healing usually follow. Most of the author's cases with late radionecrosis not only survived this complication but were cured of cancer.

The pathologist sees the terminal necrosis of the involved bone at which time infection overshadows the malignant extension or radiation necrosis. Biopsy specimens from bone are too often not characteristic because the specimens submitted are rarely large enough to give a cross-section of the entire diseased area. In addition, at autopsy the pathologist does not dare remove the mandible which is the mainstay of the facial configuration and must be preserved — so that much valuable material is lost.

Case Reports

The following case reports are cited to illustrate some of the above remarks.

CASE 1. — No. 13353. S.B., colored female, married, aged 26. Admitted June 26, 1936, from another city hospital, with history of two months growth in mouth: "noticed black on toothbrush." Biopsy from other hospital showed melanoma. Otherwise feels well. Previous history showed rt. posterior molar extracted in 1933. Preliminary examination revealed in posterior part of the rt. upper dental ridge that there is a large, spongy, black growth around the site of the posterior extracted molar and extending forward. Multiple small, black moles over face and anterior chest. Excision of melanoma of rt. upper gingiva and extraction of adjacent teeth was made July 3, 1936. Biopsy from mouth of soft tissue and bone tissue showed the latter invaded by melanoma. X-ray examination, August 19, 1936, shows no destruction of the mandibles; numerous examinations of the chest since admission showed no metastases. Operation was performed July 15, 1936, for removal of metastatic melanoma, rt. superior cervical area. Biopsy showed metastatic melanoma. Wound healed — no nodes. At present primary lesion is healed but there is melanotic pigmentation along the superior gingival line.

This was a case of melanoma of gingiva with extension into the adjacent bone — insufficient in amount to show on x-ray yet visible in microscopic section. Its presence in young, colored female makes it doubly unusual.

CASE 2. — No. 14463. C. LaF., male, cook, French, aged 59, admitted May 22, 1936 from a private hospital, with history of three years growth, right side of tongue with pain and

difficult deglutition. One week nose bleed. July, 1933 — Biopsy: oral hygiene and radiation therapy. Radon implants into tongue (private hospital). In Nov. 1933, hemorrhage from tumor controlled by packing. History of chancre 20 years ago. Preliminary examination showed evidence of hemiglossectomy — no recurrence or regional lymph nodes. Very poor dental hygiene. Treatment (private hospital) consisted of total of 1200 "R" units to each of 3 fields — right submaxillary, right cheek, left side of neck from July 10, 1933 to August 1, 1933. Interstitial radium 3500 MgM hours (12 implants), into tumor on right side of tongue and floor of mouth. The pathologist's report showed squamous cell carcinoma of tongue. Wassermann — 4 plus. X-ray examination, May 23, 1936 revealed cardiac enlargement with aneurysm of aorta. Right mandible: Absence of a piece about 2 cm. in extent from angle, superiorly. There was no evidence of recurrence — nose bleed stopped. Discharge out to other hospital for further follow-up.

This was a case of carcinoma of tongue treated by surgical excision subsequent to oral hygiene, x-ray therapy and radon implant insertion. Removal of section of mandible — no recurrence or metastases 3 yrs. later.

CASE 3. — M. H., aged 63, admitted from another city hospital, January 19, 1933, died February 18, 1933; history revealed patient had all teeth removed 1½ years prior to admission. Some bleeding occurred at that time from one area in lower jaw. Six months later the right lower jaw began to swell, became gradually larger. Received 3 courses of radium treatment at another city hospital. On admission patient had some difficulty in swallowing with aspiration of liquids through post-nares. Local preliminary examination disclosed that there is an extensive exuberant and destructive growth involving the right side of floor of mouth and lower alveolar mucosa. It extends along the entire length of posterior half of floor of mouth. There is induration of right cheek and metastatic nodes in right submaxillary and cervical regions. A diagnosis of epithelioma of right lower alveolar mucosa with marked local extension and metastases to regional lymph nodes. Biopsy report showed squamous cell epithelioma, Gr. III. Wassermann — negative. X-ray examination, January 23, 1933 of mandible revealed in right mandible an irregular area of destruction for a distance of 4 cm. On Feb. 16, 1933, patient developed erysipelas of right cheek and expired Feb. 18, 1933.

This was a squamous cell epithelioma of rt. lower alveolar mucous membrane with marked local extension and metastases of regional lymph nodes and also bone necrosis with history of previous radium therapy.

Is this a case solely of extension of primary; radiation necrosis, or extension following radiation necrosis? (As Berven has suggested.)

CASE 4. — R. H., American, telegraph operator, aged 62, admitted from another city hospital, January 30, 1936, gave a history of pain under left side of tongue and ulceration for 4 weeks. Difficulty in swallowing — 4 months. Preliminary information (from other city hospital) dates back 22 months with history of rough ulceration underneath tongue. On August, 1935, went to other city hospital for this lesion on left side of tongue. On September, 1935, 2 mgm. needles were inserted in left anterior floor of the mouth with a total dosage of 1840 mgm. hours. Subsequently this patient developed pain in left side of tongue. X-ray revealed destructive changes involving the alveolar processes to right and left of mid line. On Jan. 25, 1936, patient had a mandibular block on left side — 70 per cent alcohol. Examination August, 1935, in other city hospital, revealed a slight thickening of right sublingual duct. In left anterior floor of mouth is a small, hard, granular, elongated growth extending from the frenulum back along the sublingual duct and becoming narrower. Near the mid line it measures 1 cm. in diameter and at its rear it measures ½ cm. in diameter. It is 2½ cm. long. It does not bleed on examination. No palpable neck nodes present.

Examination at Cancer Hospital, January 30, 1936, reveals a residual slough in left side of anterior part of the floor of the mouth. The surrounding tissue is firm and fibrotic. The left side of tongue is also firm either as a result of radiation fibrosis or due to some malignancy present. There is no activity observed. No regional adenopathy is noted. X-ray examination made February 28, 1936 shows there are no destructive bone changes noted in the mandibles. Patient examined August 6, 1936 and exposure of left mandible was noted. No local recurrence. There is a small, hard nodule in left submaxillary area which may be metastatic or inflammatory.

The carcinoma of the floor of the mouth was treated with radium insertion. Subsequently bone necrosis developed (due to radium), which apparently has cleared up roentgenologically although clinically it is denuded of soft tissue at one point. No local recurrence.

CASE 5. — J. B., aged 64, admitted to clinic, April 25, 1928; admitted to hospital July 31,

1933; died November 17, 1933, gave history: About 3 or 4 weeks prior to first admission, patient noticed a small, white sore on the right lower gum. No bleeding, occasional pain, gonorrhea and lues in 1883. No anti-luetic therapy. Examination revealed on the membrane of the alveolar process of the mandible at the level of the right first molar tooth there is a small excavation involving both lateral and internal surfaces of the process. The ulceration is surrounded by a slightly raised, firm margin and the surface is covered with white, necrotic material. It does not bleed on manipulation. It is about $1\frac{1}{2}$ inches diameter, irregular in shape. A patch of leukoplakia is noted at the level of the last molar tooth $\frac{3}{4}$ inch in diameter. Diagnosis of epithelioma of gum on basis of leukoplakia was made, excision and radiation was advised. X-ray examination, April 26, 1928 of mandible showed no destruction. April 30, the lesion was excised under local anesthesia and 6 glass tubes of 1.8 radon inserted for 132 hours. Path. squamous cell epithelioma, April 30. Intensive radium radiation was given from April 30, 1928 to April 8, 1929. Last seen at Clinic on Dec. 13, 1929 when high voltage therapy was advised.

Patient returned to the Clinic on June 21, 1933 stating that he had felt well until 5 months previously when the right cheek became swollen. He went to another city hospital where a course of high voltage therapy was given and immediately thereafter erysipelas of that side of the face appeared. Following that a sinus appeared in the skin which has been draining. Blood Wassermann on June 24, 1933, was reported 4 plus. X-ray examination, July 1, 1933, of mandible showed a destructive process in the mid portion of the right mandible involving about 3.5 cm. of the bone. The inferior portion still remains grossly intact. The superior portion is completely destroyed for an area about 1 cm. in diameter. These findings indicate malignant changes due to contiguity extension. Course of high voltage therapy was given to both submaxillary areas at Clinic 400 "R" Units to each area; five injections of bismogenol given. Biopsy, July 8: Squamous cell epithelioma, adult type.

Patient admitted to hospital, July 31, 1933. X-ray examination, August 2, 1933, of mandible showed a large irregular area of destruction in the right mandible. High voltage course given to lesion completed October 31. On November 13, ligation of right external carotid artery done under paraldehyde anesthesia. Following operation patient ran a temperature of 106 F. and expired on November 17, 1933.

This patient had a recurrent alveolar carcinoma with bone necrosis complicated by syphilis, and was treated with radium and x-ray.

CASE 6. — L. F., male, Russian, hat worker, aged 48, admitted May 19, 1933, from another city hospital, gave history of mouth lesion of 18 months duration. Patient first developed a sore on the lower lip about 18 months ago. Was treated with radium at Brooklyn city hospital. Later a growth appeared on the right side of the floor of the mouth which was also radiated. At present time patient is complaining of growth on inner surface of right side of cheek. Examination reveals leukoplakia on the lower lip, which is soft and shows no activity. Beginning on the mucous surface of the right corner of the mouth there is a growth extending along the right buccal mucosa for a distance of one inch. There is a deep crater of the right side of floor of mouth with exposure of the inner surface of the right mandible. There is a diffuse induration in the right submaxillary area and epilation of the skin on both sides as a result of radiation. Further examination June 18, 1936, showed neoplastic ulceration of the right buccal mucosa and crater formation on the right side of the mouth. Right submaxillary adenopathy present. A diagnosis was made of epithelioma of the lower lip which later involved the other areas with metastases to the regional lymph nodes. X-ray examination, May 21, 1936, shows a numerous radon implants (10) just in front of the angle of the right mandible. Definite irregular rarefaction is noted in the mid portion of the right mandible with a localized sequestrum appearing partially extruded. In view of extensive radiation differential diagnosis must be made clinically between radiation necrosis and destruction which may be due to metastatic invasion by contiguity. Further x-ray examination, August 8, revealed an irregular destruction of the right mandible which is more pronounced, there being evidence of a pathological fracture at the anterior end. The sequestrum is more pronounced than previously.

This was a carcinoma of the lower lip with local extension and regional lymph node involvement. Radium implant therapy. Bone necrosis with sequestrum progressively increasing. In this case both the tumor and the radium caused the bone necrosis.

CASE 7. — No. 14270. J. McK., white, male, aged 53, laborer, admitted March 25, 1936, with history of being a pipe smoker and a moderate drinker. Eight months pain in left side of jaw and dysphagia. Following dental extraction six weeks ago developed swelling of the throat. Biopsy in another city hospital showed squamous cell epithelioma. Examination revealed marked infection of the gum and teeth. Large, irregular multilobular mass in left ton-

sil and adjacent part of throat and mouth. Cervical nodes palpated. Endothermic coagulation of left tonsillar tumor November 21, 1935 at another city hospital. Radium pack left neck 77,000 mg.; right neck — 80,000 mg. Twenty .3 Mc seeds in left tonsillar residue, February 20, 1936. X-ray examination March 26, 1936 revealed no bone pathology. 10 radon implants in left posterior oropharynx. Died on May 5, 1936 of bronchopneumonia. Diagnosis: Carcinoma left tonsil with metastases to cervical nodes.

There was no bone necrosis despite extensive radium therapy.

CASE 8. — No. 6723. J. R., male, white, plumber, aged 67, admitted July 22, 1930 with history of four months swelling of right face. Has been chewing tobacco for 42 years. Examination reveals ulceration of alveolar border of right mandible, including jaw bone. X-ray examination July 23, 1930 showed irregular destruction of right mandible.

The diagnosis was alveolar mucous membrane epithelioma with bone necrosis by extension. No therapy.

CASE 9. — E. H., a male, aged 48, admitted March 22, 1933 from another city hospital; discharged April 19, 1933 to House of Calvary. The history revealed swelling of right cheek—3 weeks. Has had bad teeth for a long time. Three weeks ago following an extraction, developed swelling of the inner aspect of the right cheek with gradually involved outer cheek and right side of neck. Slight temperature. Pain has been moderate. Local, present examination disclosed right cheek and jaw diffusely swollen, hard, indurated, not tender. The patient is able to open mouth 2-3 inches. The visible teeth are in terrible condition, carious. Digital examination reveals an irregular mass in the right lower alveolar ridge extending into the buccal mucosa and posteriorly as far as the finger can reach. There is no fetid odor from the mouth. Neck: Two, large non-tender firm nodes in the right submaxillary and retromandibular areas. A diagnosis was made of carcinoma of the right lower alveolar ridge with local extension and cervical metastases. Irrigation advised March 23, for marked trismus of mouth. X-ray examination March 24, 1933: Destructive extension of malignant neoplasia from floor of mouth malignancy with extensive dental caries and abscess formation. X-ray treatment was given to right side of face and neck until patient was transferred out at own request.

This was a case of marked infection and carcinoma of alveolar margin with bone involvement prior to x-ray therapy.

CASE 10. — No. 7574. J. M., white, Italian male, aged 63, admitted March 20, 1931 gave a history of five months increased continuous salivation and difficulty in chewing and swallowing food. Loss of 20 lbs. Examination revealed marked dental caries, teeth poor; foul odor of breath. Anterior border of tongue and surface, adjacent floor of mouth and mucous membrane show an extensive ulceration, the lower frontal teeth are loose and imbedded in the tumor. Large, lymph node in left submaxillary area. Dental extraction and custodial care to be given. X-ray examination March 24, 1931 showed irregular destruction in superoanterior part of the left mandible with teeth extending into it.

There was found a marked mouth infection, carcinoma, anterior end of tongue, extension to floor of mouth and left mandible and left submaxillary lymph node involvement. No radiation therapy was administered.

CASE 11. — J. A., a male, aged 45, admitted January 19, 1933 from another city hospital, presented history of noticing pain and swelling of the right lower jaw seventeen months ago. Believed it to be due to poor teeth and neglected the condition. Seven months later visited the dentist who refused to treat him and advised hospitalization. The skin on the jaw broke down one month ago. Intraoral examination shows denudation of the right mandible; a foul-smelling deep necrotic crater is seen. There is massive, neoplastic infiltration in the right tonsillar region. The tongue is mobile. Externally there is induration of the right submaxillary and cervical areas. Ulceration of the skin over the right mandible through which a bony sequestrum protrudes. Diagnosis: Carcinoma of the right lower alveolar mucosa with bony involvement and regional metastases. Blood Wassermann reported negative, January 25. X-ray examination, January 23 of mandibles disclosed irregular destruction along the superior margin of the horizontal and ascending portions of the right mandible and also the angle, with distinct evidence of a pathological fracture in front of the angle. The portion of the bone remaining in the mandible appears much rarefied and irregular. These findings indicate an extensive malignant destructive involvement of the right mandible with a pathological fracture. On January 27, 1933, under ether anesthesia,

the sequestrum and necrotic portion of the right mandible was removed. The pathologist report January 27, gave squamous cell epithelioma involving bone by extension. Patient died March 3, 1933, following hemorrhage from the lesion.

This also showed a marked mouth infection; carcinoma of right lower alveolar mucosa with regional metastases and bone involvement. No radiation therapy was prescribed.

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Discussion

Dr. G. Allen Robinson (New York): There is no one method that can be used in management of malignant lesions of the head and neck. It is gratifying to know also that there is now a much closer understanding between the surgeon, the radiologist and the pathologist.

I think it is the exception rather than the rule that a malignant tumor with invasion of the neck nodes is operated without having the primary lesion diagnosed. In some of the transitional tumors you may find, at the first visit of the patient, malignant invasion of the neck without finding the primary lesion. Sooner or later they show up.

Another point brought out very clearly is the effect of increased or better filters. We do not see the severe latent skin reactions as shown in some of the other types of cases.

In regard to Dr. Ehrlich's paper, I think we have a subject which needs a great deal of study. There is not much we can say in a moment or two about it except that we see these necrotic bone lesions, infection, invasion of growth, radiation necrosis or combinations that are very difficult to handle.

I have seen invasion of the nasal sinuses with new growth and the question arises, how to treat malignant tumor of the antrum. We believe at the present time there should first be given heavy doses of x-ray. Then we should see that proper damage has taken place, and then the dosage may be supplemented by interstitial application of radium tubes or implants. Particularly when the growth has invaded the orbital plate do we err when we try to remove bony parts at the time the patient first comes to us. There is, of course, considerable pain over a period of months, but if we are patient we find that in a large percentage of these cases sequestra of bone will come away within from six months to two years.

Necrosis of the mandible of the upper jaw requires cooperation of the dentist. The teeth should receive first consideration in intraoral carcinoma, bad teeth extracted and oral hygiene improved.

Arthur F. Van Weert, D.D.S. (New York): Necrosis occurs more often in the lower jaw than in the upper jaw. One classifies necrosis, which means the death of cells or tissue in the living organism in:

(1) gangrene — necrosis of a large mass of tissue; (2) focal necrosis — death of a group of cells surrounded by living cells as in focal necrosis of the liver; (3) coagulation necrosis — characterized by the production of fibrin (false membrane in diphtheria); (4) liquefaction necrosis — intercellular substances break down, forming fluid or pus with cells floating in the fluid. Necrosis must be distinguished from other forms of bone diseases such as caries or suppurating osteitis. The necrosis of the jaw is usually preceded by osteoperiostitis, by osteitis or osteomyelitis. It is caused by: (1) infection through dental lesions; (2) systematic diseases which undermine the vital resistance of the patient; (3) drugs or poisons such as phosphorus, arsenic or mercury; (4) traumatic injuries; (5) sepsis introduced in local anesthesia in septic area or by contamination of the injected fluid or instruments; (6) infection through malignant tumors. Similar to necrosis is caries which is a molecular destruction of bone, while necrosis is death en masse. Caries proceed slowly by granular degeneration of cells, with fatty degeneration and finally caseation, and is caused especially by tuberculosis causing diseases of the periosteum, marrow and bone. Necrosis takes more quickly and is usually due to a disturbance of the blood supply. In all cases, to make sure of a diagnosis, an x-ray, not only of the diseased area but also of the whole skull, is essential, because a picture of the skull is more often necessary than it is usually practiced. A patient who comes to the dentist with a loose tooth, which has no signs of pure dental disease, affords always a picture of the whole skull. The picture will often reveal the presence of a fracture of the bone, not discernible to the eye, because the fractured ends are in position and the articulation of the teeth is complete. After the extraction, the ends become dislocated and as a result, the dentist gets a law suit,

accusing him of having broken the jaw. The same can happen when there is an expanded cyst which leaves only a very small bridge of sound bone tissue, which will break easily during the extraction or a short time after the extraction. The x-ray picture will furthermore reveal the presence of tumors and the beginning of necrosis, caused by pyorrhea and infected teeth.

Dr. William Watson (New York): Our experience on the Head and Neck Service at the Memorial Hospital has led us to the conclusion that osteomyelitis present before or developing during the course of treatment for intraoral cancer is unfortunate, common and frequently a fatal complication. Dr. Ehrlich is to be congratulated and thanked for his courage as a roentgen therapist in bringing to our attention this subject of intraoral bone necrosis. The topic is undoubtedly important enough to warrant frank and thoughtful discussion.

The surgeon who treats intraoral cancer has his very definite operative mortality, his postoperative shock, infection, cellulitis and hemorrhage to contend with and the radiation therapist no less who treats the same diseases has the specter of bone necrosis as an ever possible post radiation complication for which he should assume a major portion of the responsibility.

The blood vascular system of bone renders this tissue particularly susceptible to strangulation from occlusion of the Haversian canals. Then too, the periosteal blood vessels, the nutrient and capsular arteries, are subject to post radiation thickening and decrease in size of lumen resulting in diminished bone nutrition. Bone tissue contains a high proportion of calcium, has an atomic weight of 40 and when heavily radiated by high voltage x-ray or radium produces an unusual degree of secondary radiation. This plays a part in bringing about a state of chronic radiation osteitis. Regaud, in calling attention to the great susceptibility of the maxillary bones to necrosis and infection during the treatment of intraoral carcinoma, attributed this susceptibility to the action of the secondary radiation arising from the calcium deposited in the bone.

Intraoral cancer is apt to occur in luetic individuals presenting a poor dental status and varying degrees of oral sepsis. Add to this a condition of severe radiation mucositis with pain, and this type of patient will allow his mouth condition to really become deplorable. Recognizing the importance of intraoral hygiene for these patients during their prolonged course of treatment, we have established a special daily "clean-up" clinic for the daily care of these cases during and immediately after their course of treatment. The patients are also put on a detailed regime of irrigations, etc., which they carry out in their homes.

Bone necrosis when it appears in the

superior maxilla can be readily handled by surgical excision. When healing takes place the patient can be fitted with an upper denture and a prosthetic attachment to fill the defect. On the other hand, bone necrosis—osteomyelitis, when it occurs in the mandible is usually accompanied by a marked degree of cellulitis of the surrounding tissues, copious purulent discharge with systemic and gastric absorption, together with trismus, pain, emaciation and dehydration. Such a setting in elderly patients makes jaw resection a hazardous operative procedure and for this reason we have adopted a very conservative method of treatment, although the sequestrum separates very slowly and much patience is necessary in order to successfully salvage the patient. Insufferable pain occasionally may be relieved by injection of 95% alcohol into the third division of the fifth cranial nerve on the affected side.

Knowing what a serious problem is presented by postradiation intraoral bone necrosis, what can be done to prevent it? Careful dental and oral care before, during and after radiation will lower the incidence. Further help may be obtained by the careful selection of the type and amount of radiation to be given.

Dr. George A. Wyeth (New York): I agree with some things that have been mentioned and with others I disagree.

Electrosurgery is technical, more technical than surgery. If you want to do electrosurgery properly, you must know the technic of electrosurgery.

Dr. Clark of Philadelphia tried to teach the profession the difference between desiccation and coagulation. I have been, for a number of years, trying to tell the profession the difference between desiccation and coagulation. You do not obtain scarring in all superficial lesions; where you do not want to cause penetration into the depths of the tissue, use desiccation. The desiccating current must be understood to be used properly.

Most of the machines brought to our attention do not properly give a desiccating current. The best current produced was by the old Leyden jar, which would allow the desiccating spark to remain on the surface without causing penetration. For the lesions around the eyelids, I recommend particularly the use of desiccation instead of coagulation, because you get no scar there in these lesions.

I am sorry to learn that one of the doctors uses the scalpel instead of the cutting current. Results would be better with the latter. It sterilizes as it cuts, which is an advantage.

I think one great trouble we doctors have in treating cancer is that we do not make proper diagnoses. Proper and detailed diagnosis should be made before we start to treat cases.

Biopsy is a very simple matter when the patient comes to the office. Your office attendant can make a frozen section in fifteen minutes. A correct diagnosis

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FURTHER STUDIES IN ULTRAVIOLET TREATMENT OF ERYSIPELAS *

MILAND E. KNAPP, M.D.

MINNEAPOLIS, MINNESOTA

In the aged and the very young erysipelas is a serious and frequently fatal disease. In the past a multitude of treatments has been advocated for this affliction, which is evidence of their ineffectiveness. The most recent of these are roentgen radiation, erysipelas streptococcus antitoxin and ultraviolet radiation. Of these, ultraviolet radiation has now been shown to be the most effective as well as the most easily available method.

The mode of action of ultraviolet upon erysipelas has not been explained as yet. It is apparently not an actual bactericidal action. Titus has suggested that it may be a "chemical reaction brought about in the skin upon certain protein substances, either an effect upon the nucleoprotein of the bacteria themselves or a change in the chemical composition of the tissues, so that there is an increased resistance to the sensitizing action of the bacteria. The "transudate of serum may be affected in such a way as to form an autoantitoxin." The prolonged erythema of the skin may be an important factor for it is necessary to use heavy doses to accomplish favorable results.

In 1929 Ude and Platou reported a series of seventy-nine cases of erysipelas treated at the Minneapolis General Hospital with ultraviolet radiation. They compared the results obtained by this method with those of conventional procedures and concluded that ultraviolet radiation was more effective. Since that time ultraviolet radiation has been consistently used at the Minneapolis General Hospital as the treatment of choice for erysipelas of all types, and the results have been satisfactory.

Two years ago I reported upon 340 cases of erysipelas treated by ultraviolet radiation alone. This was really a continuation of the work of Ude and Platou and extended the study through the year 1934. The present report brings the study through the year of 1936.

During 1935 and 1936 there have been treated 116 cases of erysipelas. Of these, 91 were treated by ultraviolet radiation alone.

Technic

The dosage used varied according to the resident in charge of the contagious service, but in general ranged from 5 to 20 erythema doses. Some of these treatments were given with a Hanovia mercury arc lamp and some with the so-called cold quartz type of lamp. The technic consisted in exposing the involved area and a margin of one to three inches of normal skin to the ultraviolet radiation. In facial erysipelas the eyelids were left uncovered if they were involved, otherwise, the eyeballs were covered with small circles of paper, leaving the eyebrows exposed. When multiple exposures were necessary, the edges were allowed to overlap. In most cases no packs of any sort were used, because they seem to inhibit the development of maximum erythema. Sterile white vaseline was applied at times after wrinkling and desquamation had begun to relieve the feeling of tenseness of the skin.

* Read at the Mid-Western and Southern Sectional Meeting of the American Congress of Physical Therapy, St. Louis, Missouri, March 9, 1937.

TABLE 1. — *Analysis of Past and Recent Cases of Erysipelas Treated With Ultraviolet*

	Ude and Platon	1929-1934	1935-1936
No. cases treated.....	79	340	91
No. and percentage of deaths.....	6 or 7.6%	28 or 8.23%	8 or 8.79%
No. and percentage of deaths due directly to erysipelas.....	5 or 6.3%	27 or 7.94%	6 or 6.59%
No. of recoveries	73	313	83
Average time to normal temperature.....	3.16 days	3.90 days	3.73 days
Extensions after treatment.....	6 or 7.6%	28 or 8.94%	18 or 19.78%
Average duration treatment to discharge.....	8.2 days	8.67 days	7.74 days
Average duration onset to discharge.....	10.4 days	11.34 days	10.44 days
No. of patients less than 1 year of age.....	3	7	5
Percentage of deaths among patients less than one year of age.....	33 1/3%	0	20%

Results

In comparing the results of treatment obtained in this series with those previously reported, and with the earlier results of Ude and Platon, we find a remarkable similarity. The results were analyzed in the same manner as in the previous reports to insure accurate comparison. Major emphasis has been placed on the following factors: (a) the duration in days from treatment to normal temperature; (b) the average duration of the disease from treatment to discharge from the contagious department; (c) the average duration of the disease from onset to discharge from the contagious department; (d) extension after treatment. The temperature was considered normal when it did not rise above 99 degrees F. Cases which ran an afebrile course have been excluded from the calculations as have those in which the temperature was obviously due to complications.

In comparing the figures the average durations from treatment to normal temperature in the three series were respectively 3.16 days, 3.90 days, and 3.73 days. The average duration from treatment to discharge were 8.2 days, 8.67 days, and 7.74 days; from onset to discharge, 10.4 days, 11.34 days, and 10.44 days, respectively.

There were 19.78 per cent extensions in this series as compared to 8.94 and 7.6 per cent in the previous series. This is due, I believe, to the fact that there was used an old and inefficient lamp for a considerable time. This lamp has now been replaced.

Complications

The complicating factors in erysipelas may be divided into two groups — those which are a result of the erysipelas and those in which the erysipelas is a complication of pre-existing disease. Of course, in this latter group it is often difficult to say whether the original disease or the erysipelas is the most important factor in the outcome. Most of the deaths occurred in this group.

The only complication resulting directly from the erysipelas itself in this series of cases was abscess formation. This occurred in five cases or 6.02 per cent of the 83 cases that recovered or 5.49 per cent of the entire series.

In 28 cases or 30.76 per cent of the series erysipelas occurred as a complication of other pre-existing disease. Seven of the eight deaths occurred in this group. In this series recovery from the erysipelas was accomplished in 3 cases of scarlet fever, in 2 cases of impetigo, and in one case each of cardiac decompensation, chronic otitis media, psoriasis, fractured nose, chronic arthritis, abscess of the leg, generalized peritonitis and a pelvic ab-

secess, gonorrheal endometritis with infected episiotomy wound, mastoidectomy, burns, old hemiplegia with fracture of left tibia and fibula, syphilis, chronic otitis media and bronchopneumonia, osteomyelitis, fracture of the hip, frozen face, and dementia paralytica.

Deaths

There were eight deaths in the group. Only one of these was not complicated by at least one other disease and he had positive diphtheria cultures. This was in a man aged 44 years who died 15 days after the onset of his erysipelas. The other cases were:

1. A female, aged 9 months, admitted to the hospital with bilateral bronchopneumonia on February 3, 1936. She then developed empyema in the left chest and thoracentesis was done on the 5th, 6th, 8th, 9th, 11th, and 14th of February. On the 10th she developed erysipelas of the face and the vulva. On the 17th a closed drainage was done, and on the 19th she died.
2. Male, aged 76, with chronic uremia.
3. Male, aged 80, with coronary sclerosis and chronic glomerulonephritis.
4. Male, aged 74, with senility and decubitus ulcers.
5. Male, aged 46, who had been hospitalized for 9 years with Parkinson's disease.
6. Male, aged 80, with carcinoma of the parotid gland and bronchopneumonia.
7. Male, aged 59, with cirrhosis of the liver who died on the day of treatment. Post-mortem showed rupture of esophageal varices with hemorrhage into the stomach.

The last two are the cases in which the death was considered not to be due directly to erysipelas. Thus there were six cases in which erysipelas was probably a factor in causing death. This is 6.59 per cent of the entire series. Nearly all of these were in the older age groups.

Erysipelas in Children

Erysipelas has long been known as an extremely fatal disease in small children. The mortality rate has usually been reported at 50 to 75 per cent with the older methods of treatment.

In this series there were nine children whose ages were 3 years, 2 years, 1½ years, 16 months, 1 year, 9 months, 4½ months, and two at 1 month. Only one of these died. To this group I can add three private cases under one year of age without a death.

Accordingly from 1929 through 1936, all 4 series, had 18 children under one year of age with only 2 deaths or 11.1 per cent. This I believe is a remarkably good record.

Conclusions

1. Ninety-one cases of erysipelas treated by ultraviolet alone are added to the previous reports from the Minneapolis General Hospital. This enlarges the entire series to 510 cases.
2. Ultraviolet radiation has given consistently good results over a period of eight years.
3. The complications and deaths are discussed.
4. Ultraviolet seems to be particularly useful in reducing the mortality among small children.

Discussion

Dr. J. G. Jenkins (Temple, Texas): Dr. Knapp and I are very much in accord on the treatment of erysipelas. For the last few years we have been using ultraviolet, and so far we have found that it is much more satisfactory than the old method. Of course, we use the cold compresses, and we use some serums. I remember back when we used ichthyol, probably for the psychic effect of the color. I doubt if we got much results from it. In those

days the cases would run for several weeks, and the convalescence was very slow. But since we have been using ultraviolet we find that the cases respond much more rapidly and that the period of convalescence is very short. The patients are allowed to leave the hospital in much less time.

I think Dr. Knapp is correct when he says that it is necessary to use heavy dosage. I find that it is necessary to use

an erythema dose which comes up to the formation of blebs, or almost to the arresting point. As to the results, Dr. Knapp's and our results are comparable. He shows that the temperature returns to normal in 3.16 to 3.90 days, and in our series of cases we showed that the temperature returned to normal in 3.84 days, which is practically the same. As to the number of days in hospital, in our series we show that the patient was in the hospital 3.13 days, and his is a little higher. He is working in a general hospital, where probably most of his cases may be charity cases, and in the hospital I am in they are not, or the majority of them are not. Of course, we have to treat some charity cases. We probably let them out a little sooner, as the patients desire to cut down the expense.

The complications vary in erysipelas, as they do in other conditions. We find some cases come into the hospital with some other condition and then develop erysipelas. They may come in with erysipelas and then develop other conditions. I do not know how many children are in our series, but we have had one death in a baby 20 days old when it came in,

and it had had erysipelas then about three days. This child did not respond to the first treatment, responded very nicely to the second treatment, but developed a meningeal condition from which it died.

We had one other patient, a lady, who entered for a post-partum pelvic infection. She developed erysipelas, which cleared up after about five days, but she died apparently from a condition of the heart due to the toxemia. Whether this was due to toxemia from the erysipelas or toxemia from the pelvic infection we were not able to tell.

Dr. Miland E. Knapp (closing): Ultraviolet radiation is available in almost all communities. The only point that should be absolutely stressed in heavy dosage. Reported failures proved to be ascribable to suberythema dosage. This is far from a tonic treatment, and we have found our best results with twenty times the erythema dose that is calculated for a particular lamp. If a lamp is old, one will find that although giving the treatment for the same length of time and at the same distance, one is not giving the same amount of ultraviolet, but a heavy dosage of ultraviolet is essential to get results.

Short Wave Low Intensity Current — Weissenberg

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SHORT WAVES AS A PYRETOGENIC AGENT *

ANDRE HALPHEN, M.D.

and

JACQUES AUCLAIR, M.D.

PARIS

Spontaneous fever is a complex reaction, but artificial fever is even more so on account of the specific effect of the different pyretogenic agents. These consist of the intravenous or intramuscular injections of vaccines, proteins, bacteria, chemical products, physical agents and the like.

Subjected to either one of these pyretogenic agents, patients, no doubt, will not react in exactly the same way. However, one constant symptom will be found a factor common to all fevers and which seems by its importance to mask the other reactions, the rise of the central temperature. On the other hand, physiology has shown us that there is a great analogy between these different fevers. Finally, from the clinical point of view, whatever pyretogenic agent is employed, whatever its unquestionable specific effect, whatever the importance of the shock obtained, the diseases which are treated are always the same, and the statistics of success are almost exchangeable.

That is why one tends at present to give predominance to the hyperthermic factor in fever, and conceives the importance of physical pyretotherapy, which permits control of this factor common to all fevers, and especially its dosage.

The continual progress in the technic has rendered physical pyretotherapy easy to manage, safe, and measurable. It has scarcely any contraindications and therefore extends the field of action. As a matter of fact, one need not refuse to treat old people, children, the defective, nor the feeble. The treatment can be given at whatever hour one chooses, as slowly and carefully as one wants, where one can regulate at will the required duration and which, finally, may be repeated at the indicated intervals and stopped in an instant, if need arise.

Our first trials of physical pyretotherapy date back to 1930. Since that period, apart from our proper researches, we have been in personal contact with the majority of those who have devoted their efforts to advance the method. Among these we must particularly mention Neymann and Carpenter. One of us had the privilege of observing their first work in their own laboratories.

Our first short wave apparatus of pyretotherapy was designed from the data of Whitney and Carpenter. Since that time we have treated more than 3,000 patients for the most varied diseases. One part of the documents that we have thus collected has been utilized for the drafting of the French reports for this Congress.

If one only considers the clinical and biologic conclusions brought forward here, on one side by the American authors, and on the other side by ourselves, after seven years of research and of treatments, one may rejoice on the agreement of ideas and the identity of the results. On the other hand, there is one fact that one notes with surprise — the American authors have, for the most part, abandoned pyretotherapy by short waves to which they can legitimately claim paternity, in favor of other pyretogenic agents, in particular of the "Kettering Hypertherm," while all the results

* Read at the First International Fever Therapy Conference, New York City, March 29, 1937.

of physical pyretotherapy brought forward by the French authors have been obtained with short waves.

It would be unfortunate if one should conclude that we are backward and only adopt a method at the moment when progress has caused it to be considered obsolete by its first prime movers. Also we wish to demonstrate here that it is regrettable that the American authors should have abandoned the short waves in pyretotherapy without having drawn from it all that it could give. To us the short waves still are the most powerful thermogenic agent and the most easy of control, which with our technic have first place in physical pyretotherapy.

The Carpenter Apparatus

In the apparatus utilized by Carpenter, the patient was placed at the very interior of the electric field of very high frequency, between the vertical and parallel plates of the condenser, in which he played the role of a bad dielectric. This arrangement, though permitting easily enough the rise of temperature, was far from being perfect. In spite of absence of contact with the electrodes, the disposition of the lines of force was such in the field and on the subject that he was frequently burned, especially at the parts where there was perspiration. Now, the loss of sweat is abundant, since it readily goes beyond one liter during each treatment. It was therefore necessary to provide a complicated drying apparatus which was onerous, and, far more serious, dispersed a great quantity of the calories in proportion as one endeavored to contend rapidly with the short wave current generator to heat the patient. One was thus brought to heat this air very strongly, to make it humid, in one word, to "condition" it.

The American physicians with all their ingenuity have brought to the maximum of perfection this indispensable accessory, and they have succeeded perfectly in creating this hot and humid atmosphere. The following anecdote is now well known to all: A nurse started the apparatus for conditioning the air, but forgot to start the short wave current generator. At the end of the treatment she perceived that her patient had 40 degrees C. and at the same time that the short wave generator had not functioned. The omission of the short wave current generator appeared as a necessary simplification, and this gave birth to the "Kettering Hypertherm."

When we started our work, after having tried the standard diathermy, we employed the same installation as Carpenter. We found the same faults, difficulties in making the patient's temperature rise and the permanent menace of burns, notwithstanding the addition of the drying equipment.

But it seemed to us regrettable to abandon a thermogenic agent capable of producing heat in the very mass of the tissues, in favor of an apparatus which causes it to penetrate by thermic equilibrium proceeding from superheated teguments. Most certainly one has no advantage in thus ignoring one of the physiologic conditions of endogenous fever.

On the other hand the painful impression caused to a patient who enters into a box of an unattractive appearance and the very disagreeable sensation due to the excessive heating of the skin, have led us to direct our efforts not towards the improvement of drying the patient, but towards its suppression by modifying the distribution and the entrance door of the current.

Authors' Technic

We have succeeded by employing the following technic: The patient, dressed in a bath robe, lies down on a treatment bed and is then covered with blankets, as in an ordinary bed. His movements are free, he can read,

drink, without difficulty. There is nothing visible which can affect or inconvenience him, he is on a bed of a normal appearance and has no contact with any of the elements of the heating apparatus.

The electrodes are placed under the bed, behind the patient, at about ten centimeters from the back which presents itself almost as a plane and which, for this reason, provides an entry-door for the homogeneous and regular current. The two electrodes, horizontal in a same plane, movable on this plane by a sliding system, can be regulated according to the height of the patient. They are joined by flexible cables to the short wave current generator.

From the technical point of view with a similar disposition, the reciprocal capacity of the electrodes is negligible in relation to the capacity of each one with the body of the subject, which is very big. One thus increases greatly the ohmic resistance of the circuit in the patient (in the proportion of 2 to 3 for 1); the law of Joule remaining applicable, one diminishes by so much the density of entry of the current for an equal energy scattered at the level of the tissues. From the practical point of view this one modification of the place of the electrodes is sufficient to abolish the risk of burns.

An apparatus of 700 watts thus equipped is sufficient to give a patient of 70 kgs. a temperature of 40 degrees C. in less than half an hour, no matter what the activity of his thermo-regulation. Nevertheless, one has an advantage in having at one's disposal a more powerful apparatus (1 kilowatt). The gradation in the regulating of the generator permits of attaining the required temperature in the time that one wishes, in any individual. So far as the safety of the method that we propose is concerned, let us say that we have been able to treat thus without incident precocious insane, for whom it was the rule to tie them on their bed without taking notice of their protestations.

Finally, one may, without stopping the treatment, touch the patient, take his pulse and his temperature. All measures of supervision are therefore extremely easy. During the course of prolonged strong pyrexia the nurse not having to occupy herself with the regulation of the apparatus, can concentrate her attention on the patient, can control his reactions so as to modify, if necessary, the progress of the treatment. The hyperthermy may be as slight or as high as one wishes, as rapid and as prolonged as is necessary.

The easy handling and the suppleness of the treatment, its simplicity, safety, the facility of numerous therapeutic controls, the absolute identity of the successive thermic curves in a same subject, and finally the relative but certain comfort that the method gives compared not only with endogenous pyretotherapy, but also with the other physical agents of pyretotherapy, are the qualities that the other methods try to obtain with more or less success, and that are united in the short waves. It is for this technic, employed more and more and which will without doubt become standard, that we have chosen the term "Electropyrexia" which has since been adopted by the greater number of authors.

But the short waves also remain an incomparable agent for local or regional thermotherapy. The discussions of this Congress will probably establish that the frontiers between pyretotherapy and thermotherapy are not sharply defined. There are cases where pyretotherapy is only an artifice destined to obtain a local rise of the temperature which in itself presents a sufficient therapeutic value. The short waves often permit making the econ-

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PROCTOLOGIC ELECTROSURGERY *

I. MORTON BRENNER, M.D.

NEW YORK

The possibilities and advantages of electrosurgery have been apparent to me since 1931 when I began the development of electrosurgical procedures for the various pathologic processes in proctology. Five years of experience leaves no doubt in my mind as to their value.

It is the purpose of this communication to convey by description the application of the high frequency cutting current in this special field. In every case to be presented the operation was performed under local analgesia, the choice of which is left to the individual surgeon. My own technic for profound analgesia of the entire rectal area is submitted for consideration. I feel that in all rectal cases requiring operation it is sound practice to anesthetize the entire rectal area and divulse the sphincters, thereby removing every possibility of discomfort even if unexpected complications are encountered. I likewise believe that divulsion is more beneficial than is commonly believed. The technic I employ requires that the patient is placed on the table in the left lateral position with the knees drawn up. A suitable lamp at the foot of the operating table affords the best means of illumination. A point midway between the anus and the coccyx is selected as the first point of entry. This area can be sprayed with ethyl chloride or touched with phenol, subsequently neutralized with alcohol, to eliminate the pain of the first needle puncture. With this accomplished a few drops of the analgesic are installed into the tissues. For this initial instillation a preparation known as Novocol, H. P. is used, which is followed by benzocaine oil solution, (Benzocaine 3.0, Benzyl Alcohol 10.0, Phenol 1.0, Olive Oil 86.00). From this initial point of entry the solution is gradually instilled upward and outward to the left median line of the anus, deep into the tissues, and parallel to the rectal wall. The right side is next treated in a similar manner, endeavoring with each movement to spread the solution fanwise into both posterior and lateral quadrants. The most anterior anesthetized point is located on the left side and instilled from there upward parallel to the rectal wall and also anterior to the median raphe. The right side is treated in the same manner. The anterior middle line which is more or less difficult to anesthetize is then entered and the solution spread upward and backward on both sides, just as was done at the start in the posterior midline. Four points of entry were thus made, each about one-half to three-fourths of an inch away from the anal aperture. For this procedure use is made of a one and one-fourth inch 22 gauge needle through which about 4 or 5 cc. are injected both posteriorly and anteriorly. This analgesia not only affords profound anesthesia during operation but for seven to twelve days, thus preventing post-operative pain and discomfort. It is through the development of these newer oil analgesics that much of rectal surgery has become an office procedure.

About five minutes should elapse before one is able to operate without causing discomfort. The insertion of one finger into the rectum without distress is an indication that one may proceed. The injected fluid should be gently massaged with one finger inside of the rectum and with the fingers of the other hand from without in order to equally distribute the fluid

* Read at the Fifteenth Annual Session of the American Congress of Physical Therapy, New York City, September 11, 1936.

around the rectal wall. Manual or instrumental divulsion may now be performed.

For operation with the cutting current an inactive electrode of block tin about one square foot is placed under the left hip. A foot switch is essential and should be within convenient reach.

The active (cutting) electrode should be locked in the insulating handle. The apparatus is tested and the spark gap adjusted. With these few very simple but important details accomplished, one is ready to operate.

It may not be amiss to point out that with a reliable apparatus neither the patient nor the surgeon's hand can sustain a shock, since the high frequency current is concentrated close to the tip of the operating electrode, to say nothing of the well-known law that with high frequency currents neuromuscular contractions do not take place. Slight burns are possible by improper contact with the electrodes — inactive as well as active. Even if the active electrode should touch a metal speculum, for example, no harm will ensue.

So far as the cutting technic proper is concerned one must acquire by practice on suitable material (raw meat) properly controlling the current, so that incisions proceed neither too rapidly nor too slowly. The proper guiding of the active electrode is something that cannot be adequately described.

The precaution should be taken never to wear an electric headlight when operating with any electrical modality. There may be, and usually is, a grounding of the house current from which one can experience a bad shock or even death. For the same reason one should not use an electrically illuminated speculum.

Affections Amenable to Electrosurgery

Removal of one or more skin tags, often erroneously referred to as external hemorrhoids can be accomplished at one sitting after divulsion. If one tag is to be removed, only the tissues directly under it need be anesthetized. The tag is then lifted by means of a clamp or forceps and held slightly taut while being severed. This is accomplished with a straight wire electrode. The tip of the electrode is placed lightly against the skin at the required point of amputation and by intermittent cuts is carried around the tag until it is completely removed. Bleeding is controlled by touching with the ball electrode.

Verrucae acuminatae are removed by means of a wire loop electrode. The loop is placed at one end of the area to be removed, the current turned on and the loop drawn across the growth. Small shot-like verrucae are removed by coagulation with the ball electrode.

For the removal of the *mucosal covering of crypts and buried fissures* we have in the cutting current an exceedingly valuable agent. The accepted surgical technic for this operation is to insert a crypt hook, lift the tissues tent-like and cut them off flush with the basal mucosa. Shreds and overlapping tissue are then trimmed. The base is touched with some form of escharotic and the wound packed with a wick of gauze. The after care of these wounds is tedious and painful. In many cases bridging occurs, which necessitates pulling the wound apart in order to granulate the base. The excision of these crypts and also fissures is greatly simplified by using the following electrosurgical technic. An insulated hook, which I designed a few years ago, is inserted into the crypt or buried fissure and a small wire loop electrode slipped over it at its distal end. This wire is then at the internal opening of the crypt or fissure. The current is turned

on and the loop drawn from within outward along the hook, which acts as a guide. In passing it severs all tissue with which it comes in contact and at the same time leaves a thin film of coagulation along the resultant tract. Thus in its cutting it not only removes the mucosal covering of the crypt or fissure, but also controls bleeding and by the superficial coagulation prevents the wounds from bridging. This is desirable, because less attention is needed during convalescence. The fact that these wounds are a trifle slower in healing is an advantage rather than a disadvantage. Shreds that remain at the edges of wounds are removed with the straight wire electrode.

Although the analgesia which has been described is sufficient to control all postoperative pain, another advantage of this current is that it causes an additional desensitization, through coagulation of the exposed tissue. Trauma to the surrounding tissue is minimized. All this clearly shows the superiority of this technic over the older procedures.

Polypi are simply amputated. After complete analgesia and divulsion, the polyp is exposed through a bivalve speculum, lifted up and amputated at its base either by a loop or straight wire electrode. Hemorrhage is easily controlled by coagulation, or if necessary by ligature. For excision of fistulous tracts the cutting current has proved of especially high value. Classic surgery with its trauma and extensive tissue resection cannot possibly compare with the advantages as offered by electrosurgery. Patients suffering from a fistula do not have to be hospitalized for weeks and subjected to extensive radical surgery, followed by a painful and stormy convalescence, to say nothing of the possibility of recurrence. Electrosurgically these tracts are excised in the office without subsequent protracted confinement. Even if the fistulae are multiple or extensive their excision is ultimately accomplished by the step-by-step method. True, it may be that this requires a much longer period of time for accomplishment, but the end results are comparatively more positive and gratifying.

The aim of operative intervention for fistula is to locate and close the internal opening. At times this is simple, but more often very difficult. If the fistula tract is short and does not extend too far from the anal margin it may be excised at one sitting. This is done by inserting a bone probe into the external opening and allowing it to protrude into the lumen of the rectum. A loop electrode is thrown over the distal end, the current turned on and the loop drawn outward. This removes the entire fistula tract en masse, transfixed so to speak, on the probe. The size of the loop should be as small as possible so that no extra tissue, especially that traversing the sphincters, is excised. The entire tract, as can be readily seen, is removed in one procedure. The after care is simple, but necessitates constant observation against bridging.

In more extensive fistulae the step-by-step method of removal is necessary. The procedure in these cases is always carried out from without toward the internal opening. Taking for illustration a case with the external opening two to three inches from the anal verge, or where there is more than one opening and the internal opening has been definitely located, the procedure is as follows: An insulated probe is inserted into the external and directed toward the internal opening. A small wire electrode is thrown over the probe at the skin or distal end and drawn inward as the current is turned on, cutting the tissues from without inward along the probe. In this manner the covering and lateral walls of the fistula are removed up to a selected point. The posterior wall, if cicatrized, is then peeled off with the loop, and the incision packed. In this way one to one and a half inches of the fistulous tract is removed. After a week

or ten days this procedure is again repeated and the external opening brought closer to the anal margin. This is repeated as necessity requires until the external opening is brought close to the anal margin. With this accomplished the last step is carried out as described in the operation for a short fistula or crypt operation.

During the period through which this is carried out the patient is never confined for more than a few days, these being the days on which the several operations were performed. This is also economically advantageous to the patient.

According to my experience cures have been obtained in one hundred per cent of all fistula cases. This, of course, depends upon the surgical acumen of the operator and his success in finding and excising the internal opening. With the technic described, the surgeon can take all the time needed to accomplish this purpose.

Pilonidal cysts are excised in mass, as one would remove any area of tissue. There is no special technic required, but one should resect all scar tissue from the side walls and floor. Being sure that only healthy tissue lines the cavity. The wound must then be tightly packed, so that healing occurs from the bottom and recurrence through bridging of the skin is prevented.

156 West 86th Street.

Discussion

Dr. Michael Canick (Brooklyn): Electrocoagulation and electrodissection have a definite place in general surgery and especially in proctology, since we are working in an infected area. In verruca acuminata, non-specific condylomata, and other warty types of growths in the anal region electrocoagulation is ideal because stripping of the whole skin and recurrence are avoided. Polypi high in the rectum can be easily removed without fear of hemorrhage.

I believe prolonged oil anesthesia is often deleterious, having seen at least five ischiorectal abscesses following the injection of these substances. There is definite devitalization of the tissue likely to mask not only postoperative pain, but also pain which may indicate the onset of infection. I am also opposed to preoperative dilatation of the sphincter, digitally or instrumentally, as the anesthetized sphincter cannot resist undue stretching without sustaining numerous little tears in muscle fibers which often result in incontinence. The only dilatation permissible is with the proctoscope since it exerts even circular pressure.

Regarding hemorrhoids the electric treatment would be desirable, in such types where the injection method is indicated, when there is a complete ring of hemorrhoidal tissue without healthy mucosa intervening, in simple cases of prolapsed mucosa in the aged and very young persons, and where there is no complicating fissure, fistula, or external hemorrhoids. For the latter cases I make a plea for the ordinary surgical procedure, as in such cases it is not only a matter of the removal of pathologic tissue, but is more in the nature of a plastic

operation to restore the anal skin and particularly the transitional epithelium in as intact a form as possible.

Removal of scar tissue of a complicated and old fistula is also best accomplished surgically. No matter how complicated a fistula is, it can be done in one stage and if the sphincter is cut properly, there is no fear of incontinence.

Dr. I. Morton Brenner (closing): I am not very surprised that Dr. Canick refutes some of the points I have stressed, because unfortunately those who have been doing classic surgery in the rectum are unfamiliar with the end results of electrosurgery.

I read many years ago that 90 per cent of all hemorrhoids would be cured solely by divulsion and without anything else. Today we find that that is probably the most essential and effective procedure over everything else that we do. It is not only essential, it is imperative to perform divulsion. I have never seen one adverse result from the procedure. It affords an opportunity of getting into the rectum to determine any pathologic process. It is amazing to see that affections of the crypts have been overlooked. Practically every skin tab that is hanging from the verge of a rectum is hollow from the inside.

In regard to the excision of the old chronic fistulous tracts I think we have an Utopia with the cutting current. One takes a loop, sees the field and peels it off as gently as you would scrape the finger nail along a cake of butter, and excavates the tract down to normal tissue, while with classic surgery we have a bloody field requiring constant mopping.

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IONTOPHORESIS OF ACETYL - BETA METHYLCHOLINE CHLORIDE IN PERIPHERAL VASCULAR DISEASES *

THEODORE COHN, B.S.

and

SIMON BENSON, Ph.D.

CHICAGO

Acetyl-beta methylcholine chloride, according to Reid Hunt¹, was introduced in 1909, by Taveau, re-synthesized by Renshaw in 1929, and in 1934 was produced on a large scale by Major and Cline.² This drug, Simonart³ found to be much more useful clinically than the acetyl-choline group. It is destroyed more slowly in the blood and body fluids, more potent, and devoid of the undesirable by-effects of acetyl-choline. Starr⁴ reported that administered subcutaneously its action is noted within two minutes and ceases within fifteen to twenty minutes. There is a slight fall of blood pressure, increase in pulse rate, flushing and sweating, and stimulation of the salivary flow.

Wright and Pemberton,⁵ Rhumann,⁶ Lunedei and Corradini⁷ and Kovács⁸ found that circulatory disturbances frequently accompany and aggravate chronic arthritis, and that improvement of circulation therefore plays an important part in the therapy of arthritis.

Kovács was the first to administer acetyl-beta methylcholine chloride by iontophoresis in arthritis and peripheral vascular disorders. He found experimentally: that the drug produced "gooseflesh" due to contraction of the erector muscles of the hair follicles; sweating, which was probably due to the direct action of the drug on the sweat glands or their nerve supply; an increase in skin temperature; increase in the rate of local capillary flow without enlargement of the capillaries; increased salivation; increased oscillometric indices; reduction of swelling and increased mobility of the affected limb; relief from pain; and a questionable increase in leucocyte count. He also observed a lowering of blood pressure, increased pulse rate, and increased intestinal peristalsis. These results were not considered due to a counterirritant effect but to the deposition of the drug in the superficial tissues from which it is slowly absorbed, thus creating a prolonged local effect.

Comroe and Starr⁹ found that acetyl-beta methylcholine chloride exhibited effects similar to those obtained by stimulation of the parasympathetic nervous system. If a patient suffers any ill effects from the administration of the drug, they can be abolished instantly by an injection of 1/100 grain of atropine sulphate¹⁰. The drug is contraindicated in patients suffering from asthma on account of the possibility of producing slight pulmonary edema¹¹.

Wright et al. did not have such favorable results in peripheral vascular disorders as Kovács. We felt therefore, it desirable to repeat the work with iontophoresis of acetyl-beta methylcholine chloride and gain our own clinical impression of its value.

Technic. At first we followed the method described by various authors, namely, that of using asbestos electrode material. In seeking to overcome some definitely undesirable features of this method, a new technic was developed by one of us (S. B.)¹² and later modified by the other (T. C.).

* From the Department of Physiology, University of Chicago; and the Department of Physical Therapy, Michael Reese Hospital.

As electrode material next to the skin we used a white cotton sock, a size or two larger than that ordinarily worn by the patient. When saturated with the solution, the sock shrinks, creating a snug, but not too tight, fit over the foot. A flannel bandage, of any suitable length and width, is saturated with a freshly prepared solution (1:500) of acetyl-beta methylcholine chloride and is wrapped around the sock. The flannel serves the dual purpose of a reservoir for the solution during treatment and as an added protective layer between the skin and the metal foil strip. The latter is approximately one inch wide and three feet long. It is wound over the flannel and serves to distribute the current over the area to be treated. This entire electrode is then completely wrapped with a pure rubber bandage which helps to prevent excessive evaporation of the solution, and to hold the electrode firmly to the skin (fig. 1).

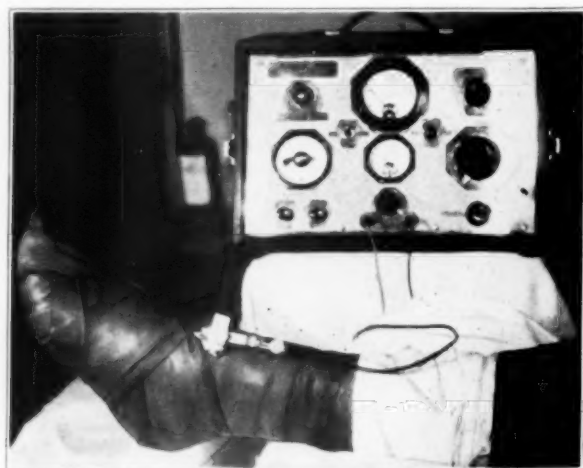


Fig. 1. — Rubber bandage wrapped over the flannel and metal foil to prevent evaporation of solution.

A large dispersive moist pad electrode is applied to the back of the patient in order to close the circuit. This pad is soaked in saline solution to aid conduction of the current.

The active electrode is connected to the positive pole and the dispersive electrode to the negative pole of a galvanic generator. Care must be taken to prevent the metal strip or any part of the clamps from touching the patient's skin.

When all connections are secure, the resistance of the circuit is taken. We found that when the resistance exceeds ten thousand ohms, the patient is unable to tolerate much current. The resistance can be lowered by bringing the dispersive closer to the active electrode.

We have adopted the following formula as a guide to the rate and amount of current to be applied. The current is increased slowly to five milliamperes and maintained for two and one-half minutes. It is then increased very slowly until the maximum amount tolerated comfortably is attained. Many of our patients were able to tolerate sixty milliamperes, the maximum output of the apparatus, while one patient was able to tolerate only one milliampere of current, which was then maintained throughout the course of the treatment.

Treatment extends over a period of twenty minutes. At the end of

this time, the current is slowly diminished at the rate of approximately three milliamperes per second. The electrode is removed, the treated part thoroughly inspected for burns, carefully dried, and immediately covered with the patient's clothing.

Physiologic Changes

The most striking effect was a flushing of the treated area. On hairy individuals "gooseflesh" was noted, lasting, however, but for a few minutes. Oscillometric indices increased in several patients. Blood pressure decreased following most of the treatments, such decreases never exceeding eighteen millimeters of mercury. We observed an increase in pulse rate which never exceeded ten beats per minute. Local sweating was noted in a few patients. An increase of skin temperature not exceeding one degree centigrade was noted in the majority of patients.

Concurrent with these findings were an increase in walking ability without pain up to indefinite distances, a sensation of warmth lasting from an hour to a period extending from treatment to treatment, relief from pain, decreased swelling, and a feeling of general improvement and well-being.

From time to time we substituted distilled water for the solution of acetyl-beta methylcholine chloride. This caused flushing of the skin in splotches as contrasted to the regular and uniform flushing following use of the drug. The flushing due to the distilled water treatment disappeared in from five to ten minutes. Questioning of the patient after treatment with this placebo revealed that the treatment was not as effective as the others with the drug. The patients, of course, were unaware of the substitution of the fluids.

We also reversed the polarity of the galvanic generator in several instances. The results of this reversal were comparable with the distilled water substitution.

Discussion

Treatments were administered two times a week. Seventeen patients were given a total of 258 treatments (tables 1-3). Lessening of pain or swelling, increased walking ability, and increased skin temperatures were considered as proof of improvement. Whenever a patient, in the judgment of the physicians of the peripheral vascular clinic, exhibited one or more of these manifestations, he was considered improved. All subjective improvements were, of course, obtained directly from the patients. On this basis, we found that of the seventeen patients treated, ten were definitely benefited. Three patients gave doubtful results. One offered reports which were very unreliable and the findings were inconsistent. In two cases, only three and two treatments, respectively, were administered, owing to the inconvenience of the treatments to the patients. We feel that the number of treatments administered to these two patients were too few to draw any definite conclusions. Four patients showed no improvement. In the latter group was one patient, who had one leg amputated and the remaining leg in an advanced stage of thrombo-angiitis obliterans.

All cases with arteriosclerosis, except one, were definitely improved by the treatment, and seven patients out of thirteen with thrombo-angiitis obliterans were benefited. It is well to keep in mind, however, that a patient in such an advanced stage as the one imputed case mentioned above is probably beyond the scope of restoration or improvement by any known form of therapy. Also the number of treatments given in each case must be considered.

TABLE 1.—*Mecholyl Treatment of 17 Patients With Peripheral Vascular Disease*

Patient	Sex	Age	Diagnosis	No. of Treat- ments proved	Condition Before Treatment	Condition Following Treatment	Remarks
1. M.H.	male	66	Thrombo-angiitis obliterans	41	+	Hands and feet cold. Walking distance about two blocks. Occasional rest pain. Waking and cramps in calves after walking one short block. Feet cold.	Hands and feet warm continuously. No walking or rest pain. Walking ability increased (?). Patient's reports unreliable and post-treatment findings inconsistent.
2. L.B.	male	75	Arteriosclerosis Ischemia	10	?	Intense walking pain and rest pain. Feet cold.	Walking ability increased. No rest pain. Feet warmer.
3. E.T.	female	54	Arteriosclerosis	21	+	No walking distance, rest pain. Feet cold, cramps in calves.	Walking improved. Feet cold. No rest pain or cramps.
4. A.K.	male	49	Thrombo-angiitis obliterans	40	+	No walking distance. Feet cold. Cramps in calves.	Same.
5. M.S.	male	62	Thrombo-angiitis obliterans	5	—	Intense walking and rest pain. Feet cold.	Same.
6. J.G.	male	60	Thrombo-angiitis obliterans	3	?	Pain in legs while standing and walking. Feet cold.	Too few treatments to draw def- inite conclusions.
7. W.A.	male	69	Thrombo-angiitis obliterans	16	+	No walking distance. Rest pain. Legs edematous. Feet cold.	Too few treatments to draw def- inite conclusions.
8. C.D.	male	66	Thrombo-angiitis obliterans	2	?	Walking pain and cramps in calves. Feet cold.	Too few treatments to draw def- inite conclusions.
9. S.W.	male	59	Arteriosclerosis	39	+	Cramps in leg. Feet cold. Unable to use crutch due to pain in leg and foot.	Walking ability increased. No rest pain. Feet warm.
10. J.M.	male	47	Thrombo-angiitis obliterans	12	+	Intense rest pain.	Foot warm. No cramps or pain. Using crutch.
11. M.G.	male	63	Thrombo-angiitis obliterans	23	—	Left leg and foot cold. Toes cyanotic. Intense rest pain. No walking distance. Pain in hands. One toe suppurating.	Same.
12. S.H.	male	39	Thrombo-angiitis obliterans	14	—	Walking and rest pain. Feet cold.	Same.
13. J.P.	male	56	Thrombo-angiitis obliterans	17	—	Walking pain. Cramps in calves. Feet cold. Rest pain. Pain in shoulders.	Decreased rest pain. Slight im- provement in walking ability. Feet warmer.
14. F.O.	male	70	Arteriosclerosis Ischemia	5	+	Walking and rest pain. Feet cold. Pain in spine.	Walking ability increased. Feet warmer. Pain in spine diminished.
15. M.R.	male	56	Thrombo-angiitis obliterans. Mild arteriosclerosis	7	+	Walking pain. Occasional rest pain. Feet cold.	Walking ability increased. No rest pain. Feet warmer.
16. E.W.	female	45	Thrombo-angiitis obliterans	5	+	Pain and cramps in legs while walking. Feet cold.	No walking pain or cramps. Feet warm.
17. M.K.	male	47	Thrombo-angiitis obliterans	7	+		

TABLE 2. — *Thrombo-Angiitis Obliterans*

	Treatments Total No.	Greatest in Any Case	Least in Any Case	Average of All Cases
No. of cases.....	13	41	2	14.8
Cases improved	7	41	5	18.3
Cases not improved.....	4	23	5	14.8
Cases doubtful	2	3	2	2.5

TABLE 3. — *Arteriosclerosis*

	Treatments Total No.	Greatest in Any Case	Least in Any Case	Average of All Cases
No. of cases.....	4	66	5	16.5
Cases improved	3	56	5	18.7
Cases not improved.....	1	10	..	10.0
Cases doubtful	1	10	..	10.0

Conclusions *

1. Acetyl-beta methylcholine chloride introduced into the tissues by iontophoresis produced a prolonged local effect.
2. Control experiments showed that the effects are produced only if the drug is administered at the positive pole of a galvanic generator.
3. Control experiments showed that the effects are produced by the action of acetyl-beta methylcholine chloride and are not due merely to galvanism.
4. The treatment appears to be of definite clinical value in cases of arteriosclerosis and has a definite place in treatment of peripheral vascular disturbances such as Buerger's disease.

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Bone Necrosis in Intraoral Cancer — Ehrlich

(Concluded from page 571)

with the aid of biopsy leads to a more rational treatment.

The three fundamental things that underlie every treatment of cancer are the kind of malignancy, the grade of malig-

nancy, and its radiosensitivity. With this knowledge the surgeon would not cut into a radiosensitive lesion and get into trouble. It would also prevent the radiologist from radiating a radioresistant lesion.

Proctologic Electrosurgery — Brenner

(Concluded from page 582)

With this current the procedure is simplicity itself.

As far as local oil analgesia is concerned I have heard that same remark made on several occasions at several conventions during the past seven or eight years and I can only answer Dr. Canick that in using this form of analgesia one must never instill the fluid in one place. It has to be injected in tracts, fan-like. I have never seen a slough in twelve years.

Some years ago at a meeting of the American Proctological Association, I think it was Dr. Barns who read a paper upon the unsatisfactory results obtained with hemorrhoidal excision. He stated that deep down in their hearts all men present were not entirely satisfied with their hemorrhoidectomies. There was not a dissenting voice nor was that paper discussed, because of the knowledge that classic hemorrhoidectomy has produced undesirable effects not excepting rectal stricture.

Short Waves as Pyretogenic Agent — Halphen and Auclair

(Concluded from page 578)

omy of an organic reaction inopportune. We will see from the different reports of specialists (urology, otorhinology) with what facility the highest temperatures may be obtained in no matter what part of the body. There is a domain which is proper to the short waves, and of which actually one can only surmise its therapeutic possibilities.

Meetings of Physical Therapy Organizations

In this permanent column will be published information about meetings, election of officers, etc., of physical therapy organizations. New data should be sent promptly to the office of the Secretary, 1100 Park Avenue, New York.

American Congress of Physical Therapy; Cincinnati, September 20th to 24th; Dr. Richard Kovács, 1100 Park Avenue, New York, Secretary.

Academy of Physical Medicine. Annual Session, Hotel Walton, Philadelphia, October 19, 20, 21. Herman A. Osgood, M.D., Secretary, 144 Commonwealth Avenue, Boston.

Pacific Physical Therapy Association; meetings at Hollywood Hospital, Hollywood, Calif. Cora Smith King, M.D., Secretary, Hollywood Hospital.

Kings County Medical Society, Physical Therapy Section; meetings at 1313 Bedford Avenue, Brooklyn, bi-monthly on second Thursdays; Dr. H. T. Zankel, 5 St. Paul's Place, Brooklyn, Secretary.

International Society of Medical Hydrology. The next annual meeting will be held during the week of October 18-22 in Wiesbaden. Excursions will be made to Frankfurt, Bad Nauheim and other resorts. Write to Dr. F. Howard Humphris, 4, Great Stanhope St., Park Lane, W.1. London, England.

Pennsylvania Physical Therapy Association; meetings at the Philadelphia County Medical Society Building, third Thursdays from September to June; Dr. Arno L. Zack, 216 East Broad Street, Bethlehem, Pa., Secretary.

New England Physical Therapy Society; meetings at Boston on second Wednesdays from October to June; Dr. William McFee, 41 Bay State Road, Boston, Mass., Secretary.

New York Physical Therapy Society; meetings at the New York Academy of Medicine, on first Wednesdays from October to May; Dr. Madge C. L. McGuinness, 1211 Madison Avenue, New York, Secretary.

ARCHIVES of PHYSICAL THERAPY, X-RAY, RADIUM

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EDITORIALS

LOW INTENSITY SHORT WAVE RADIATION

When an international body of highly specialized workers summarize their collective labors regarding the physical, biologic and therapeutic nature and action of short wave radiation, there cannot but be assurance that such a deliberation represents the most intelligent and authoritative expression of the hour. Of the many problems surveyed and critically analyzed at the international congress on short wave radiation recently held in Vienna, none evoked greater interest or comment than those which concerned the non-heating effects of low intensity short wave fields in the form of physiologic and clinical responses. Few there were who did not listen to these deliberations without the mental reservation that the parade of data purporting to demonstrate the pain controlling and clinical effectiveness of minimal dosage justified the question whether there had not been a confusion of psychotherapy with physical therapy. The majority of those in attendance were ready to accept the endogenic basis of short wave diathermy but at the same time admitted that many problems still awaited clarification. Thus it required an open mind to appreciate the marshalled facts of clinical results obtained with short wave dosages of what for want of a better term have been designated as athermic or at least hypothermic intensities. One heard the physicist upholding the findings of the biologist, and both supporting the deductive conclusions of the clinician. The debatable terrain upon which the issue was centered was not so much whether short waves have a definitely selective field of heat concentration dependent upon the technic and wavelength utilized, but rather a consideration of the problem of the explanation of the clinical results obtained in spite of the extraordinarily weak doses incapable of demonstrating any heat effect in treated parts.

It is therefore interesting to point out that the ideology of short wave therapy rather than tending toward a single central concept is reaching out

in many directions, which no doubt will aid in modifying and broadening some original impressions and convictions. The paradox that both high and low intensity short wave fields produce tangible clinical results no doubt will prompt the question of a specific field of indication for each, and whether the results obtained by either method are duplicable or each contains inherent reactivities of special clinical significance absent in the other and therefore more applicable to certain pathologic entities.

Answer to these questions has already been fairly well anticipated by the available facts. The unpublished reports of Liebesny,¹ Weissenberg, Lakhovsky, Cigna and Dalton made at the Vienna congress² show that independently of each other these Austrian, French, Italian and English investigators are uniformly agreed that low intensity irradiations have a striking influence on syndromes in which pain predominates and that it has a favorable effect on dermatologic and deep seated functional and metabolic disturbances. Dalton pointed out its particular usefulness in adenitis secondary to septic foci, for the relief of pain in intractable post-herpetic neuritis, for the control of genito-pituitary obesity as demonstrated by a pronounced case, and in the absolute cure of extensive carbuncle obtained in an elderly woman who was in a delirious state as a result of the grave infection.

For the clinical development and scientific direction of low intensity short wave radiation the credit goes to Liebesny,³ of Vienna, for his consistent work with low thermic doses, and to Weissenberg⁴ for his sponsoring and establishing the clinical value of non-thermic short wave fields. These authors laboring in a scientific environment of acknowledged repute (the Allgemeine Krankenhaus of the University of Vienna) have correlated their clinical experiences with physiologic studies fully to disprove the implication of a psychologic factor underlying their results obtained in concrete pathologic processes. Thus their laboratory work on the physiologic influence of so-called athermic doses of short waves is an added impressive confirmation of the clinical observations made to Raab,⁵ Kobak,⁶ Wolf⁷ and others concerning the therapeutic effectiveness of mild intensities of short wave diathermy in certain pathologic conditions.

That even absence of any heat sensation or its objective demonstration in short wave radiation does not change their quality as a therapeutic agent is now suggested by physiologic proofs presented by Weissenberg⁸ elsewhere in this issue. His article partly answers the question whether a non-heating short wave emission provokes physiologic effects. It also is an effective denial of the challenge that the results of treatment are psychic rather than physical. Under the aegis of Professor Potzl, Weissenberg has the weight of 4,000 authoritatively controlled cases to substantiate the claim that "heatless" doses can produce among other reactions a deviation phenomenon differing from that of normal individuals, that they have a detumescent influence on respiratory affections, that they have a decided influence on apnea and pulmonary capacity, and that they change not only the ohmic resistance of the skin but also affect function in treated parts. From what has been said it is clear that a broader orientation of treatment with short waves is being developed. The international congress of Vienna has emphasized as yet not fully realized possibilities for good, provided the agency in question is utilized intelligently and conservatively under the scientific control of organized medicine.

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PHYSICAL MEDICINE IN AMERICA

The moment appears opportune to pause in our labors and to reflect before our trek to Cincinnati on the historic background of present-day physical medicine in the United States.

The widely prevalent idea that the recognition of physical therapy as an important branch of medicine and surgery owes its inception to the World War is incorrect. Physical Therapy has been practiced in our country long before the outbreak of that gigantic conflict, but it was at best desultory, unorganized and therefore scarcely noticed let alone appreciated by the general medical public. It is indeed noteworthy that while specialists in psychiatry, neurology, surgery, urology, dermatology and other branches had realized the scientific and economic value of national association, physical therapists at the best organized themselves as purely local groups.

Older practitioners will recall that during the latter part of the last and the early years of the present century even large hospitals had not even rudimentary equipment let alone scientifically conducted physical therapy departments. True, there were bath tubs, but that was about all that could be dignified as equipment. Coulter* vividly tells the story of the early use of cold water in the treatment of fevers by Dr. James Currie, who had migrated to America from Scotland, but this was an isolated instance. It was not until Winternitz of Vienna, and later Baruch of New York placed hydrotherapy on a scientific basis that a few Americans appreciated its potential value. Yet small institutions for its administration — usually a remodeled flat — established by male nurses emigrated from Europe failed to obtain sufficient patronage by the medical profession and had to go out of business. Russian and Turkish baths were available at a time when modern sanitary plumbing was not found in the poorer districts, but these were used by the people more as hygienic measures, though not a few utilized them for the self-treatment of rheumatic conditions. Though a comparatively few physicians saw accounts in 1906-7 of Hauffe's scientific studies on partial hot baths, this valuable procedure has not become popular to this date.

The work of Finsen (1897) with phototherapy by artificial agents attracted considerable attention, and some years later "Finsen Institutes" were established in several larger American cities, but they did not flourish and disappeared. This perhaps was due as much to the concept that the treatment was indicated only in lupus as to the costliness of the equipment. Today ultraviolet radiation has replaced the Finsen apparatus and enjoys use for many pathologic conditions.

Electrotherapy, notably with the galvanic and faradic currents, gained a better foothold in America during the present generation. It was developed

* Coulter, John S.: *Clio Medica*, VII. Physical Therapy, New York, Paul B. Hoeber, 1932.

comparatively speedily partly through refinements of apparatus which were obtainable at a small outlay and partly because the work of Apostoli in what amounts to ionization of the uterus for fibroid tumors attracted considerable attention. Franklin Martin, who eventually organized the American College of Surgeons, popularized this method. Massey of Philadelphia, and Monnell of New York share in the merit of having aroused interest in electrotherapy and in some phases of general physical therapy. The former even tried mercury cataphoresis for certain cancers.

A real impulse to scientific study of heat emanated from August Bier, the noted German surgeon, through his work on artificial hyperemia. Several American surgeons contributed monographs and articles in which they expounded Bier's teachings on the physiologic effect of heat (active hyperemia) for inflammatory processes and of congestion (passive hyperemia). Crude appliances for the local application of superheated air soon were followed by expensive, complicated chambers electrically heated. Though this method has fallen into disuse, the underlying fundamental principles remain today with the high frequency currents introduced by d'Arsonval, both in the form of conventional and of short wave diathermy.

The World War proved the proverbial ill wind that blew some one some good. Though massage, corrective exercises, also in the form as occupational therapy, were not unknown means, the opportunity to develop them on scientific lines through observation of large numbers of injured and crippled could not but arouse interest, where before but a few, especially experienced men made limited use of them. Today therapeutic exercise is an important part of physical therapy.

Since certain physical measures in contrast to pharmacotherapy and operative surgery provided an opportunity to manufacturers, both good and bad, for commercial exploitation, and the laws governing the practice of medicine were not adequate to debar untrained laymen and laywomen from making use of them in a manner to prove a menace, authoritative control of the situation became a necessity. The Council on Physical Therapy of the American Medical Association is the influential and potent body for control, while the American Congress of Physical Therapy has grown to national stature and proved instrumental not only in furthering the scientific aspect of physical medicine but in protecting the social prestige and economic interests of our recognized specialty. Though sixteen years have elapsed and the Congress can look back with satisfaction on that period for what it has accomplished, much work remains to be done.

Year in year out the annual sessions yield new ideas and experiences with the vision ever directed towards a more efficient future. For this the membership and cooperating scientists deserve all credit. But there are still noxious weeds in our garden and while planting new flowers the Congress has also the task of clearing the soil of elements that hamper the full harvest of our labors. This goal the Congress must and will pursue with energy, so that ethical scientific physicians will not have to explain to the body politic what true physical therapy actually is.

THE STUDENT'S LIBRARY

RECENT ADVANCES IN ORTHOPAEDIC SURGERY. By *B. H. Burns*, B.A., B.Ch., F.R.C.S., Orthopaedic Surgeon to St. George's Hospital; Surgeon to the Belgrave Hospital for Children; Consulting Orthopaedic Surgeon to the London County Council; and *F. H. Ellis*, M.A., B.Ch., F.R.C.S., Orthopaedic Surgeon to St. Mary's Hospital, Asst. Surgeon to the Out-patients, Paddington Green Children's Hospital; Consulting Orthopaedic Surgeon to the London County Council. Cloth. Pp. 296 with 108 illustrations. Price, \$5.00. Philadelphia: P. Blakiston's Son & Co., Inc., 1937.

This is one of the "Recent Advances Series" by this publisher. It is not a text-book but discusses the present news of the science and art of orthopedic surgery. The views, the authors believe, are largely in accord with current thought in England. There are several chapters of interest to physical therapists. The chapter on painful shoulders is taken largely from Codman's book on this condition and is an excellent summary of the whole subject. In the chapter on low back pain the etiology, pathology, and symptomatology are considered. Under treatment in this chapter Bankart's manipulation for sacro-iliac strain is given in detail. In the chapter on flat and painful feet the technic of manipulation of the foot according to Bankart is given. The remainder of the text evidences an earnest effort on the part of the authors to present the subject of orthopedics down to date.

VOCATIONAL GUIDANCE THROUGHOUT THE WORLD. A Comparative Survey. By *Franklin J. Keller*, Principal, Metropolitan Vocational High School, New York City, Former Director, National Occupational Conference; and *Morris S. Viteles*, Associate Professor of Psychology, University of Pennsylvania. Cloth. Pp. 575, illustrated. Price \$4.00. New York: W. W. Norton and Company, Inc., 1937.

This work describes what is being done throughout the world to help people find their places in the complex industrial structure of the power-machine age. It points out that by means of physical occupational therapy, vocational guidance and purposive training one may restore many disabled patients to a useful, happy life. It discusses the many useful phases of the psychology of vocational guidance, and the occupational adjustment as an important part of the rehabilitation of the crippled individual. One is early impressed with the authors' complete orientation with the many complicated problems in this field of vocational guidance. Many examples are presented to illustrate the adage that handicapped individuals are willing to work for a happy living. This theme is therefore a timely contribution, because it indicates how vocational guidance can help in the fulfillment of that common desire, not however as

a tool of intolerant political credos, but as a handmaid to political, economic and social vision that takes into account the only values that are worth anything—the human values. While not dealing directly with the problem, this book can be recommended to those interested in the vocational guidance of the crippled and the industrially disabled person.

PHYSICAL DIAGNOSIS. By *Don C. Sutton*, M.S., M.D., Associate Professor of Medicine, Northwestern University School of Medicine, Attending Physician and Chairman of the Medical Division of the Cook County Hospital, Chief of the Cardiac Clinic, Cook County Hospital; Attending Physician, The Evanston Hospital. Cloth. Pp. 495 with 298 illustrations and 8 color plates. Price, \$5.00. St. Louis: The C. V. Mosby Co., 1937.

The subtitle of this book is "The Art and Technique of History Taking and Physical Examination of the Patient in Health and Disease." It conveys a fair idea of the scope of the work. It is generally known that physical methods of examination being an art cannot altogether be acquired by theoretic instruction alone, since individual skill in eliciting and interpreting the signs and symptoms of disease is a matter of actual training of the physician's senses. Nevertheless the author has ably presented by print much that can be taught only at the bedside. In nine chapters the student is led through general considerations, examination of the chest, the heart and the abdomen with the last chapter presenting the steps required in a routine neurological examination. The text is presented in lucid language, its informative value being enhanced by numerous diagrammatic, radiographic and even photographic illustrations, some in natural colors. The underlying pathology of many diseases, too, has been given due consideration. The author's reputation as a clinical teacher in his faculty has been amply sustained by this difficult task in text-book writing, a task he has accomplished in a manner to satisfy the most critical demands by those who desire to perfect themselves in the methods facilitating the making of correct diagnoses in the principal internal diseases.

CONCEPTS AND PROBLEMS OF PSYCHOTHERAPY. By *Leland E. Hinsie*, M.D., Professor of Clinical Psychiatry, College of Physicians and Surgeons, Columbia University; Assistant Director, New York State Psychiatric Institute and Hospital; With a preface by *Nolan D. C. Leavis*, Neurological Institute of New York. Cloth. Pp. xv plus 199. Illustrated. Price \$2.75. New York: Columbia University Press, Columbia University, 1937.

It is the aim of this book to indicate the general conceptions that prevail with respect to the struc-

ture and functions of the mind, and to show, as well as possible, what influence these conceptions have had upon the problems of psychotherapy. Not only has the author presented the material which is oriented in therapy but has also given an evaluation of psychiatric methods of study and of the current concepts of the mind. His work must be recognized as an attempt to gain a comprehensive view of the facts in a subject or field much too extensive to be exclusively monopolized by one method of investigation. Physicians and students who are making serious efforts to understand the development and applications of psychotherapy, and to get to the roots of the situation, will find this book a welcome guide, formulated from a wide background of experience.

TECHNIQUE OF UNDERWATER GYMNASTICS. By *Charles LeRoy Lowman*, M.D., F.A.C.S., Chief of Staff and Director of Educational Activities, Orthopedic Hospital, Los Angeles; *Susan G. Roen*, Graduate, Sargent School of Physical Education, Director of Physical Therapy Department, Orthopedic Hospital, Los Angeles; *Ruth Aust*, B.S., University of Washington, former Physiotherapist, Orthopedic Hospital, Los Angeles; *University of California Hospital*, San Francisco; now at *Children's Hospital*, Denver; and *Helen G. Paull*, B.S., University of Wisconsin, Physiotherapist, Dr. Lowman's private gymnasium. Cloth. Price \$5.00. Pp. 270, with Index. Sponsored by Los Angeles Orthopedic Foundation, Los Angeles, American Publications, Inc., 1937.

This book is written for the express purpose of assisting those concerned with the practical application of corrective and therapeutic underwater exercises. Lowman's extensive experience in rehabilitating activities by means of hydrogymnastics and his close contact with the corrective physical educational and health work of schools and colleges renders this a valuable contribution not only for physicians, surgeons and physical therapists, but also as a guide for directors, technicians and teachers of aquatics in the use of hydrotherapy in the specific problems of posture and health. The authors "hope that the description of technical difficulties inherent in the use of hydrogymnastic muscle and joint retraining in abnormal and pathological cases will help the untrained to realize their own limitations," and at the same time stress the amount of good that can be obtained for weak and handicapped muscles through the proper use of pool treatment. The book is divided into four parts, covering the history and the use of physiotherapeutic pools; the general theory of underwater gymnastics; the conditions suitable for hydrogymnastic treatment; and the field of application for corrective aquatics. Two chapters are devoted to the construction of therapeutic pools, their location, size, cost and necessary equipment, carefully covering in detail all concerned problems. The chapters on pool technic and the conditions for which hydrogymnastics is applicable, are especially worthy of note. The monograph covers in detail poliomyelitis, spastic paralysis, neurologic and psychiatric cases, post-traumatic cases, fractures, arthritis, and infectious and open wounds. Four chapters are written for swimming teachers and

others interested in obtaining the benefits of this health-giving and body mechanics exercise. No one interested in rehabilitation, restoration of physical control, and improvement in morale of patients afflicted with the diseases under consideration can afford to be without this authoritative work.

THE INTERNATIONAL MEDICAL ANNUAL. A YEAR BOOK OF TREATMENT AND PRACTITIONER'S INDEX. Editors: *H. Letheby Tidy*, M.A., M.D. (Oxon.), F.R.C.P.; and *A. Rendle Short*, M.D., B.S., B.Sc., F.R.C.S. Pp. 555. Cloth. Price \$6.00. Baltimore: Wm. Wood and Company, 1936.

This is a year book which reports the proceedings of the previous years like the minutes of a meeting. Minutes contain no implication that the opinions expressed by the speakers are justified or that the conclusions arrived at are correct, although some discretion is used as to what is inserted. The next meeting may produce further evidence for consideration and reverse the previous decisions. The Medical Annual of 1936 presents the minutes of the meeting for 1935. They are as accurate an account of what took place as the recorders can make them. Some, perhaps, may be solved, while others will defeat our successors. The chief divisions of the book are medicine and surgery. The style of the abstracts is similar to that of previous years. Pertinent illustrations are inserted and these add substantially to the value of the reviews. Several papers on physical therapy and electrosurgery have been abstracted, a fact which has contributed to the universal knowledge dealing with these problems. It is quite certain that physicians who have added the Annual to their libraries will want this one to continue their series.

ABSORPTION FROM THE INTESTINE. By *F. Verzar*, Professor of Physiology of the University of Basle. Assisted by *E. J. McDougall*, Ph.D. Cloth. Price \$9.00. Pp. 294 with 70 illustrations. New York: Longmans, Green and Company, 1936.

This is one of a series of physiologic monographs intended to describe the present state of our knowledge on the absorption from the intestines presented especially from the authors' experience gained in this field during the last ten years. The whole question is discussed from the viewpoint of the authors, but the work of others frequently has been referred to, as is shown by an extensive bibliography. The alimentary canal is strongly differentiated in certain parts for the process of absorption, and shows many distinct physiologic functions which are necessary for the passage of foodstuffs into the blood. These are thoroughly considered in the first chapters. The absorption of water, alkali salts, heavy metals, carbohydrates, fats, lipoids and related substances, plant and animal pigments, proteins, purine bodies, alcohol, organic acids, indole, skatole and bacterial toxins, enzymes, dyestuffs and gases are discussed in separate chapters. The monograph represents a scholarly effort that is replete with studies of a scientific character. The problem of intestinal absorption is still not definitely settled in many of its aspects, and the present volume sheds much light on them. It is a work of profound interest to all

physicians who desire a better understanding of the role of intestinal digestion in health and disease.

EMANOTHERAPY. By *F. Hotcard Humphris*, M.D. (Brux.), F.R.C.P. (Ed.), D.M.R.E. (Cantab.); Honorary Consulting Radiologist to, and Member of, the Medical Advisory Board of St. John Clinic and Institute of Physical Medicine; and *Leonard Williams*, M.D., Late Physician to the French Hospital, to the German Hospital and to the Metropolitan Hospital. Cloth. Pp. 188. Price \$3.00. Baltimore: William Wood and Company, 1937.

One of the reasons given for the appearance of this book is to dispel a gross error which is very widespread and usually brought forward whenever the subject of radium therapy is mentioned—the statement that emanotherapy is dangerous and that several people have developed malignant disease and died from its use. There is no doubt that general condemnation of radium is due to lack of real knowledge concerning its properties and potencies, and to a failure to distinguish between radium emanation—the important constituent of radio-active waters useful in medical cases—and radium salts in solution. The author contends that radium is a useful tool in the hands of the trained medical man, but should not be turned loose on the public in the form of many quack preparations. It should be administered by properly trained men, and the patient should be under the observation of the doctor during the period of treatment. In this work the term "emanation" is used instead of radon therapy and mild radium therapy to avoid any possibility of mistaking it for the treatment by radium itself. It should be mentioned that under the title of emanotherapy the emanations of thorium are sometimes used, and this is termed thoron therapy. According to the author emanotherapy now has the endorsement of some of the greatest men in the present-day world, but it must be admitted that much speculation still exists concerning its value as a remedial agent. This is probably due to the fact that many physicians are unfamiliar with the indications and limitations of the agent. The author lists the diseases in which emanotherapy is indicated and in which it has been found beneficial. An attempt is made to establish the rationale of the treatment.

In the meantime it behooves us to proceed with caution, but also with diligence, in close co-operation with the scientist and our fellow-workers, and devote to this subject, and to the work of others, that same attention which has brought many of the more recent physiotherapeutic measures into practice.

It is quite possible that as time goes on we shall learn more of emanotherapy and with this knowledge we may find new channels for its activity.

Die Technik des Ungepolsterten Gipsverbandes, von Dr. *Fritz G. Schnek*, Emer. Oberarzt des Unfallkrankenhauses in Wien. Mit einem Geleitwort von Professor Dr. *Lorenz Böhrer*. Second, completely revised edition. Cloth. Pp. 27 with 270 illustrations. Price Rm. 15. Vienna: Wilhelm Maudrich (American Agency: Chicago Medical Book Co., Chicago) 1937.

Dr. Böhrer belongs the credit of having elaborated the method of applying plaster casts for fractures and

other conditions requiring immobilization without padding of any kind. The reviewer, who at first was prejudiced against this method, was soon forced to acknowledge its superiority and in agreement with many other surgeons and public institutions has entirely abandoned all layers of soft material between the cast and the skin. While the first edition of this book was already reviewed in the *Archives*, the present edition has been so completely revised that it may be regarded as a new work. There was great need for it, because now and then surgeons, both general and orthopedic, have made use of the unpadded cast and obtained unsatisfactory results because they were unfamiliar with the diverse steps worked out by years of painstaking efforts by the creator of the method. Schnek, the able pupil and follower of Böhrer, has now laid down specific rules in a most explicit manner. The text covers technique in general and takes up at great detail casts of the extremities, torso and skull. No detail has been overlooked and every articulation has been considered from its anatomico-physiologic point of view to insure good functional results. The illustrations, most of them photographic are clearly executed. This book is an absolute necessity for all who have to treat fractures, particularly because it contains new measures (e.g. cellon-plaster-bandages) to render the treatment of patients less cumbersome and inconvenient to them.

ANNUAL REPORT ON THE RESULTS OF RADIOTHERAPY IN CANCER OF THE UTERINE CERVIX. First Volume. Statements of Results Obtained in 1930 and Previous Years (collected in 1936). Edited by *J. Heyman*, M.D. Paper. Pp. 75. Price, 40 cents. New York: Columbia University Press, 1937.

The present volume is the first of a series of annual reports on the results of radiotherapy in cancer of the uterus, which the Health Committee of the League of Nations has decided to issue. The principal object of the report is to provide a convenient work of reference for those who wish to know, statistically, the results obtained in radiotherapy of the cervix uteri when agreed rules for the compilation of the statistics have been observed.

A BRIEF OUTLINE OF MODERN TREATMENT OF FRACTURES. By *H. Waldo Spiers*, A. B., M.D., Professor of Orthopaedic and Fracture Surgery, College of Medical Evangelists, Los Angeles, Calif. Second Edition. Cloth. Pp. 137. Price, \$2.00. Baltimore: William Wood & Co., 1937.

As the title implies, there are presented outlines of every phase of virtually every type of fracture, and, in terse form, we find their management suggested according to accepted methods. With many line drawings to augment the text the author actually has prepared a *multum in parvo* which not only serves well for quick reference but contains critical evaluations based on extensive experience. Even Böhrer's non-padded casts and some of his mechanical devices to insure accuracy of reduction are briefly discussed. For the purpose intended this book is one of the best in this special field of surgery.

THE INTERNATIONAL MEDICAL ANNUAL. A YEAR BOOK OF TREATMENT AND PRACTITIONER'S INDEX. Editors: *H. Letherby Tidy, M.A., M.D. (Oxon.), F.R.C.P.; A Rendle Short, M.D., B.S., B.Sc., F.R.C.S.* Pp. 606. Cloth. Price \$6.00. Baltimore: Wm. Wood and Company, 1937.

In this Annual are contained the medical activities of 1936, although the editors make note of the fact that there has been no outstanding achievement in the period covered by the reviews. The deduction is made that physiology and medical research are coming into closer relationship with clinical medicine. While the general character of the Medical Annual remains unchanged it may be noted that the index is now placed at the end of the book. As in previous editions there are numerous illustrations and color plates. These are of unquestionable value to the reader and probably save him much time in referring to the various articles. While the book in itself is of great value to the physician who has not heretofore collected the series of Medical Annuals it is undoubtedly of special interest to the one who is anxious to keep his series of Annuals up to date.

A TEXTBOOK OF ROENTGENOLOGY. THE ROENTGEN RAY IN DIAGNOSIS AND TREATMENT. By *Bede J. Michael Harrison, M.B., Ch.M., D.M.R.E. (Cantab), F.A.C.R.,* Director of Department of Roentgenology, Vancouver General Hospital, Roentgenologist to Vancouver Public Health Institute for Diseases of the Chest. Cloth. Pp. 826. Price \$10.00. Baltimore: Wm. Wood and Company, 1936.

The purpose of this book is to bring the roentgenologist more into the class of consultant. It emphasizes that the roentgenologist must be a pathologist to take his place as a consultant. This book furnishes considerable information on pathology which is essential to the roentgenologist and would appeal to the clinician as much as to the roentgenologist. The utmost that the average specialist can hope to do is to keep well informed regarding any additional aid which he can hope for from the advances in roentgenological knowledge so as to be able to cooperate with the roentgenologist sufficiently to ensure the patient obtaining the utmost value from the roentgenological investigation. It is the duty of the clinician to keep himself acquainted with the increasing value of roentgenological investigation in detecting the pathological changes underlying any clinical condition, and it is the roentgenologist's duty to be acquainted with the particular methods of examination, the particular preparation for examination, the special technical factors, the most suitable apparatus and the use of all special positions and other procedures which are necessary to elicit all the information possible, and above all to be able to interpret that information correctly. This book is intended primarily to enable the practitioner

to understand the basis on which roentgenology rests so that he may be able to appreciate the help which roentgenology can be to him in his work. While no claim is made for originality, it is the author's belief that the method of presentation represents a new departure. The book is comprehensive in scope and demonstrates beyond question a wide experience and knowledge of the subjects of roentgenology. It can be unquestionably recommended for the roentgenologist and the clinician's library.

THE 1936 YEAR BOOK OF PEDIATRICS. Edited by *Isaac A. Abt, D.Sc., M.D.,* Professor of Pediatrics, Northwestern University Medical School; Attending Physician, Passavant Hospital; Consulting Physician, St. Luke's Hospital, Chicago. With the collaboration of *Arthur F. Abt, B.S., M.D.,* Associate in Pediatrics, Northwestern University Medical School; Associate Attending Pediatrician, Michael Reese Hospital; Attending Pediatrician, Chicago Maternity Center; Attending Physician, Spaulding School for Crippled Children, Chicago. Cloth. Pp. 507. Price \$2.50. Chicago: The Year Book Publishers, 1937.

In this Year Book the world's literature dealing with pediatrics is carefully reviewed. The editors' comments are especially valuable and no doubt add to the authenticity of many of the abstracts. While undoubtedly many more articles have been published than are contained in this volume, the student, general practitioner or specialist can augment his knowledge of pediatrics by a careful review of this work.

MEDICAL UROLOGY. By *Irvin S. Koll, B.S., M.D., F.A.C.S.,* Attending Urologist, Michael Reese Hospital. Cloth. Pp. 431, with 92 illustrations and 6 color plates. Price \$5.00. St. Louis: The C. V. Mosby Co., 1937.

Although the title of this book is somewhat misleading, the author is to be felicitated for having ably organized such urologic problems as fall within the daily routine of general practitioners. Naturally this book does not pretend to describe complicated diagnostic and operative procedures, yet the term "medical" is inadequate, because minor mechanical and surgical procedures are presented in considerable detail. As a matter of fact this book is an excellent guide to what may be termed the office management of diseases of the genito-urinary apparatus that do not require major surgery. Nevertheless these have been evaluated, evidently with a view of familiarizing the reader with their indications and limitations. The book evidences fine scholarship, each separate subject being followed by an excellent bibliography for such readers who desire detailed information. For the purpose the book has been prepared it can safely be said that it fills a long felt need.

INTERNATIONAL ABSTRACTS

Physical Therapy in Delayed Union of Bone. Gordon Mackay Morrison.

M. Rec. 145:288 (April 7) 1937.

Heat and massage of the entire limb from toe to groin, daily if practical, without disturbance of position, is of inestimable value. This should be done only by the most skillful and trained hands. Diathermy undoubtedly produces some increased collateral blood supply and in this manner aids bone healing. It has been said that too much may not only inhibit repair but even destroy it. There has been in the past too much random diathermy in the hands of persons who lack proper knowledge on the subject.

Of recent years study of the influence on calcium and phosphorus metabolism exerted by the vitamins, particularly vitamin D, have been much under consideration, and rightly so. We always hoped such control in the laboratories would give us the valuable means of controlling these repair processes in the human patient. In so far as concerns some of the actual systemic diseases such as rickets, this has not been a disappointment. In so far as it applies to repair of bone damage, which is to say, fractures, the situation has not been so happy.

In the average case skillful massage following infra-red radiation, together with regulated exercises, proves the safest and most practical way of handling this problem.

Physical Therapy in Modern Hospital. Claude L. Payzant.

Hospitals 2:85, 1937.

The importance of the location of a physical therapy department in a hospital is a subject which has not been given proper consideration until recent years. Whenever possible, space in the upper part of the building should be used.

No unit should be established in hospital work until a careful selection of a chief physician has been made. A small number of treatments given by an expert technician with effective ultraviolet or infra-red generators yields the patient much more valuable therapy for less money, and hospitals should be equipped to furnish this service. The brilliant result achieved by ultraviolet therapy in the treatment of erysipelas is an outstanding achievement.

Hydrotherapy equipment can be used to great advantage in a hospital. Its usefulness is seldom given the consideration it deserves by the staff. Probably the treatment given in a hospital to an ambulatory patient adds more to his somesthesia than general hydrotherapy, including a scotch douche, followed by massage.

Short and ultrashort wave therapy in many cases offers a distinct advantage over the old method although the more rapid and more efficient heating of

deep structures. It has its place in modern physical medicine, and when many of the extreme claims for it have been abandoned and its actual value has been determined, we will have a secure and effective therapeutic weapon. No hospital can be said to be adequately equipped without it.

Suction pressure therapy of peripheral vascular diseases is a more recent development in this field. It also will have a definite sphere as a valuable adjunct in the management of increasing peripheral metabolism.

Ten years ago the possibilities of artificial fever therapy were a matter of academic interest, but today this therapy is available in the efficient hospital. Fifteen years ago multiple sclerosis was treated with spinal diathermy. Today in indicated cases, thermal therapy is a useful method, and treatment by an effective machine in the hands of a competent personnel offers hope for these unfortunates. In a general hospital comparatively little neurosyphilis is seen, and much has been accomplished in the treatment of these cases by the thermal method. A few cases of bronchial asthma have been materially improved. So far our results with fever therapy in arthritis have not given as much encouragement.

Effect of Irradiated Milk Compared With Vitamin D Oils on Inhalation Tuberculosis of Guinea Pigs. Wm. Steenken, and E. R. Baldwin.

Am. Rev. Tuber. 35:656 (May) 1937.

A repetition of the mass-feeding experiment with irradiated cream containing double-strength vitamin D, using 100 animals, gave no evidence of any influence of vitamin D on the development and course of inhalation tuberculosis in adult guinea pigs. The lesions in the groups of guinea pigs fed on irradiated and plain cream were of the same type.

Cod liver and tuna liver oil, in the same dosage of vitamin D units as used in the irradiated cream groups, and also in graded dosage, produced no differences in the lesions found in the cream-fed animals. The diet was not well tolerated.

In tenfold doses (vitamin D) the feeding of these oils was less well borne and one third of the animals died before ten weeks. The survivors when killed gave evidence of toxemia, but showed smaller spleens and less caseation without calcification. The diet of vitamin D per se is questionable in the last group.

Tumors of Nose and Throat. Gordon B. New, and Walter Kirch.

Arch. Otolaryng. 24:98 (July) 1936.

A new approach was devised for the removal of carcinoma of the tonsil and neighboring regions with the use of electrosurgery, and the method was put into practice by Macpherson. The first stage of the

operation consists in ligation of the external carotid artery; this is followed in two weeks with exposure of the growth through an incision made in the median line of the neck. Half of the hyoid bone is removed; the hyoid muscles are retracted laterally, and the growth is then destroyed with the high frequency current. The wound is closed by replacing the shifted parts, a drain being left in the lower part.

My Results With Ionization Treatment in Nasal Allergy. Virgil L. Payne.

J. Arkansas M. Soc. 33:156, 1937.

The best results have been obtained in hyper-esthethic rhinitis and asthmatic cases or those of hay fever complicated by some other manifestation of allergy. It is best to give the treatment after hay fever symptoms have started. All patients reported they had fewer colds during the winter after ionization. Iontophoresis is the best therapeutic agent that the otolaryngologist possesses for the treatment of allergic diseases of the nose. Its greatest value is in those cases that are the results of inhalants. The objections to the treatment are purely theoretical, as numerous rhinologists have presented positive proof of its practical value.

Surgical Management of Peripheral Vascular Diseases. Leo M. Zimmerman.

Illinois M. J. 70:526, 1936.

Peripheral circulatory disturbances may be of venous as well as arterial origin. The former include varicosities, abnormal arteriovenous communications, and the various types of phlebitis and thrombosis. Varicose veins are particularly susceptible to the development of phlebitis, which may terminate in eczema, ulceration and elephantiasis. Massive embolism is not a frequent sequel. Treatment consists of support by means of Unna's paste boots, followed by ligation and injection of the veins. Non-varicose superficial veins are less often affected. They become inflamed commonly, as a sequel to deep vein thrombophlebitis. Migrating phlebitis of the superficial veins is part of the picture of Buerger's disease. The deep veins may be the seat of suppurative phlebitis, with early sepsis, pyemia and death; of postoperative or puerperal thrombophlebitis, with its sequelae of persisting edema, attacks of superficial phlebitis, and obstinate ulceration; and mild, bland thromboses, the presence of which is first announced by sudden massive, and often fatal, pulmonary embolism.

The common arterial lesions are arteriosclerosis, with or without diabetes, thromboangiitis obliterans and Raynaud's disease. Treatment is essentially conservative, and consists of general prophylactic and hygiene measures, rest with graded vascular exercise, and the avoidance of tobacco. Heat and diathermy are of value. If vasospasm accompanies the lesion, foreign protein therapy aids in the establishment of collateral circulation. In the absence of a spastic component, intravenous hypertonic salt solution injections improve the circulation and promote healing of open lesions. Alternating positive and

negative pressure often tides the patient over acute crises of ischemia, until circulatory balance is restored. Severe pain can be relieved by blocking the peripheral sensory nerves, and should not constitute an indication for major amputation. Localized areas of gangrene are allowed to separate spontaneously. Major amputation may become necessary because of massive gangrene or spreading infection. In the presence of diabetes, early radical amputation may be necessary to prevent death from sepsis.

Fever Therapy for Gonococcemia and Meningococcemia with Associated Endocarditis. F. H. Krusen and E. C. Elkins.

Proc. Staff Meet. Mayo Clinic 12:324 (May 26) 1937.

Artificial fever by physical agents in septicemia and subacute endocarditis, caused by the *Streptococcus viridans*, has proved unsatisfactory in the hands of a number of investigators.

Recently several cases of chronic meningococcus septicemia treated by artificial fever have been reported. Bennett, Person and Simmons described three cases in which cure had been effected by hyperpyrexia. Platou, McElmeel and Stoesser reported a case of meningococcus septicemia in a child aged three and a half years who was treated with artificial fever. The patient was subjected to sessions of artificial fever of 106.5 degrees F. for nine to ten hours on three consecutive days. He made a prompt recovery. Warren reported one case of gonococcal septicemia of an infant which was cured by prolonged high artificial fever.

Because of the encouraging results reported by these investigators and because of the known low thermal death time of the gonococcus, fever therapy by means of the Kettering hypertherm was administered in an apparently hopeless case of gonococcal septicemia with signs of an early endocarditis. This was undertaken despite the fact that fever therapy was felt to be contraindicated in endocarditis due to the *Streptococcus viridans*.

Despite the known ineffectiveness of artificial fever in endocarditis lenta, because of remissions reported in the literature, it seemed advisable to use it in one case of gonococcemia and in one case of meningococcemia, each associated with endocarditis. Although the treatment seemed on the verge of benefiting each patient, it nevertheless failed to halt the process in the patient with gonococcemia and it was necessary to augment it by administration of "Prontosil" to effect a remission in the patient with meningococcemia. Though certain that fever therapy is of no use as a curative agent in septicemia attributable to the *Streptococcus viridans*, its use still may be considered in cases of septicemia which is caused either by the gonococcus or the meningococcus. Embolism was found on microscopic examination in case 1, in which the outcome might have been more satisfactory if prolonged fever sessions had been administered prior to the development of the endocardial

lesions. Once endocarditis has developed, there is little hope of benefiting patients even though the septicemia is caused by an organism with a comparatively low thermal death time. Nevertheless in the absence of any better method this type of treatment should be tried. The result obtained in case 2 suggests that the combination of fever therapy and intravenous administration of "Prontosil" may be effective in the treatment of meningococemia. The unusual cardiac lesion in case 1 is worthy of note. The extent of the soft vegetations on the pulmonary and mitral valves seems to indicate that they remained a focus of infection which precluded complete destruction of the gonococcus of fever therapy.

The Action of Short Radio Waves on Tissues. II. Treatment of Animal Tumors in Vivo.
Frank Dickens; Stanley F. Evans, and Hans Weil-Malherbe.

Am. J. Cancer 30:341 (June) 1937.

The action on tumors in vivo of ultra-short radio waves of wavelengths of 3.0 to 4.5 metres has been studied. Earlier results were shown to be vitiated by irregular heating due to technical imperfections; these have now been eliminated. The final apparatus and technic are described in detail. Results of treatment of transplanted tumors of some 300 rats (Jensen sarcoma and Walker carcinoma 256) and 600 mice (Crocker sarcoma 180) and of spontaneous mouse tumors are presented. A single treatment of four minutes' duration was used as a routine. The following points are clearly shown. 1. Unless the temperature of the tumor rises above a certain critical value the tumor rarely regresses. 2. Above this critical temperature the average percentage of cures is good — 88 per cent of rats, 70 per cent for mice. 3. The temperature required to produce this regression is for any given tumor the same on all wavelengths studied. Thus there is no evidence of any maximum curative effect of any one wavelength. 3. Early results of treatment of 30 spontaneous mammary tumors of mice are in principle similar to those obtained with transplanted tumors. 4. The pathological changes in the tissues following short wave diathermy are briefly described; a marked feature is the extensive hyperaemia immediately following treatment. Metabolic measurements made on tissue excised immediately after in vivo treatment showed a fairly close agreement of the critical temperature required to cause destruction of metabolism of the tumor with that required for bringing about its regression; at lower temperatures changes are observed which, as judged by the results obtained in our previous paper, seem to be due partly to heat per se, and partly to deterioration of vascular supply.

These results indicate a possible way in which a selective action of short waves on tumor tissue might arise. In this connection some points of similarity between the effects of exposure to the heating action of short waves and to radium are discussed.

Critical Events in Therapeutic Hyperpyrexia.
Samuel D. Ingham; J. M. Nielson, and Karl O. Van Hagen.

Bull. Los Angeles Neurol. Soc. 2:88 (June) 1937.

The authors have given 95 treatments with the electric blanket to eight patients and have frequently given them under conditions unfavorable to the physician. The factors which have combined to create clinical difficulties have been chiefly (1) the disturbed mental state of the patient and (2) individual reaction types. Criticism of the use of the electric blanket as a method of inducing hyperpyrexia is answered by its easy adaptability to circumstances, ease of accessibility to the patient in any crisis and ease of termination of the treatment wholly or to any degree have combined to make the blanket method our choice. It is undoubtedly a fact that mentally disturbed and uncooperative patients make this method especially advantageous. Nevertheless individual variations in tolerance to hyperpyrexia must be appreciated, which makes each treatment an individual problem. Only the most cautious and personal supervision renders the treatment of syphilis of the nervous system by this method reasonably safe.

Studies in Temperature Sensation. I. A Comparison of the Sensation Produced by Infra-red and Visible Radiation. Theodore W. Opel, and James D. Hardy.

J. Clin. Invest. 16:517 (July) 1937.

Few studies of temperature sensation have emphasized the importance of the perception of thermal change on the regulation of internal body temperature. Not only does recognition of such changes make it possible for man to provide a more comfortable environment for himself, but the automatic regulation of heat production and heat loss is dependent primarily upon it. There are many reasons why radiant heat is the most suitable stimulus for a study of temperature perception. It is the only thermal stimulus which can be applied without simultaneously provoking another sensation. The method studied provides for an objective determination of the smallest rate of irradiation which will produce sensation from sunlight, visible light and infra-red radiation. The infra-red spectrum was investigated in two portions, that of wavelength short enough to be designated as penetrating infra-red, and that of longer wavelength designated as non-penetrating. The specific stimulating qualities of the various radiations were measured for white and negro subjects.

Comparative studies of white and negro subjects showed that the negro subjects were approximately 76 per cent as sensitive to infra-red radiation as the white subjects. The white subjects were 15 per cent less sensitive than dark negroes to the thermal effects of sunlight. The effect of natural pigment upon the response to thermal radiation is significant only in the vis-

ible portion of the spectrum. The effect of natural pigment upon the thermal response to sunlight is found to be small. Therefore, pigment plays only a small role in the thermal exchange of man and his environment.

Studies in Temperature Sensation. II. The Temperature Changes Responsible for the Stimulation of the Heat End Organs. Theodore W. Oppel, and James D. Hardy.

J. Clin. Invest. 16:525 (July) 1937.

The heating of the surface of the skin of white subjects by visible radiation, penetrating infra-red radiations, and non-penetrating infra-red radiation has been measured by a radiometer. It was found that with the same incident strength of these three types of radiation the skin surface temperature is elevated highest by a non-penetrating infra-red, and least by the visible radiation. Part of this difference is due to the reflection of visible and penetrating infra-red rays from the skin. After correction for reflected radiation there is a smaller difference between the heating of the skin surface by visible, penetrating infra-red, and non-penetrating infra-red radiation.

When minimum perceptible sensation is produced by these three types of radiation the skin surface temperature is elevated higher by the visible stimulus than by the penetrating infra-red stimulus and higher by the penetrating infra-red stimulus than by the non-penetrating infra-red stimulus. Heating below the skin surface by these three types of radiation has led Oppel and Hardy to conclude that the stimulation of warm sensation depends on a decrease of the normal thermal gradient in the skin and not on the degree or rate of temperature change in the skin.

Inactivation of Poliomyelitis Virus by Ultraviolet Irradiation. John A. Toomey.

Am. J. Dis. Child. 53:1490 (June) 1937.

It has been shown that the ingestion of vitamin D protects *Macacus rhesus* monkeys when poliomyelitis virus is subsequently introduced by way of the gastrointestinal tract and that the lack of vitamin D in the routine diet makes these animals more susceptible to the disease when the virus is administered. A natural corollary to these experiments would be to determine how such factors as ultraviolet rays and viosterol

would affect the virus. Toomey showed that ultraviolet rays can inactivate the virus of poliomyelitis.

Ultra Short Wave Currents in the Treatment of Ear, Nose and Throat Conditions. Alexander F. Laszlo.

Ann. Otol., Rhin. & Laryng. 46:174 (March) 1937.

To enable him to form an unbiased opinion, the author selected 100 ear, nose and throat cases and undertook their treatment with short wave diathermy. The majority of the cases were sinus infection, thirty of which were chronic and had resisted all therapeutic and operative measures. Thirty were acute and sub-acute sinus conditions with and without pus formation. The others were laryngitis, lymphadenitis, furuncles of the ear and nose, peritonsillar abscess, acute and chronic middle ear conditions, and acute and chronic mastoids. The number of treatments given ranged from sixty to thirty-five or forty, depending on the case.

Summarizing his results, the author states: "The number of cases reported and the time elapsed are not sufficient to draw definite conclusions. We are still ignorant of the precise action of these machines. Our experience with heat in other forms is encouraging and here we have a new method of applying it. The results obtained are based more on clinical impressions than pathologic observations. The surgical principle of adequate drainage should not be forgotten and short wave therapy should be utilized only in selected cases."

Effect of Temperature on Emptying Time of Stomach. C. K. Sleeth, and E. J. Van Liere.

Am. J. Physiol. 118:272 (Feb.) 1937.

The work done by Sleeth and Van Liere on the emptying time of the stomach in five normal dogs shows that low environmental temperature decreases the emptying time of the stomach, while high environmental temperature increases the gastric emptying time. Four animals exposed to temperature averaging 15 degrees F. showed an average decrease of 17 per cent in the emptying time of the stomach, while the same number of animals exposed to temperatures averaging 90 degrees F. showed an average increase of 10 per cent in the emptying time of the stomach. The observations give experimental evidence for the basis of the recognized fact that an individual often feels more hungry during cold weather and less hungry in extremely hot weather.—Abst. J. A. M. A. 108:1140, 1937.